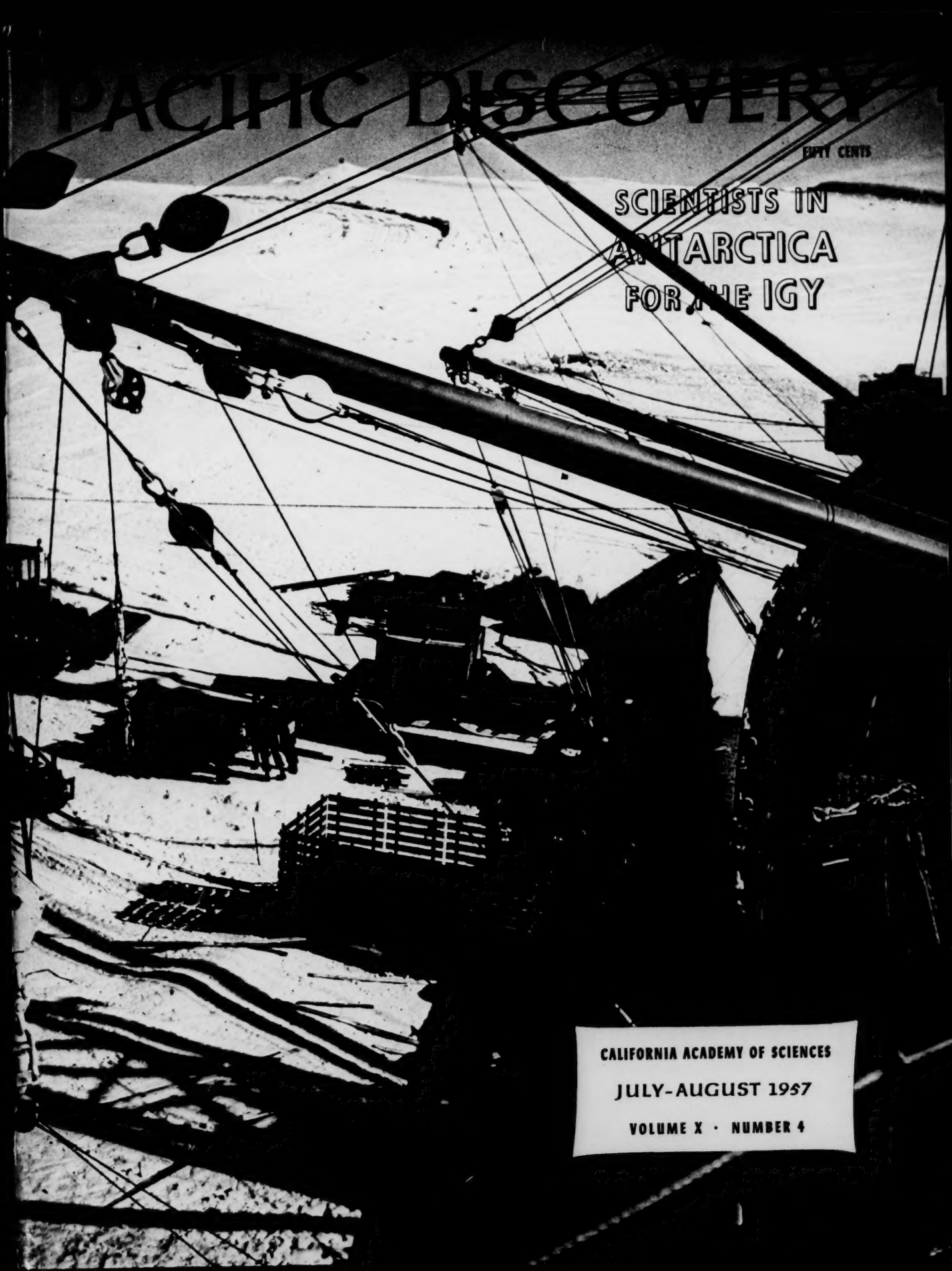
PACIFIC DISCOVERY

FIFTY CENTS

SCIENTISTS IN ANTARCTICA FOR THE IGY



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PACIFIC DISCOVERY

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PRE-DISCOVERY

PACIFIC DISCOVERY's editors are pleased to make the opening of the Third International Geophysical Year, 1957-58, the occasion for our first full color cover. Behind this is an even greater satisfaction, an occasion for feelings of pride on the part of staff and members of the California Academy of Sciences. For back of this handsome cover and the article that goes with it, introducing part of science's tremendous Antarctic program for the IGY, is a former Academy Student Member. Kim Malville was, just a very few years ago, one of the many hundreds of San Francisco and Bay Area youngsters – boys and girls – whose interest in things of nature have led them to the exhibit halls in Golden Gate Park, and on through departmental doors where curators gladly answer questions and help guide and give purpose to youthful enthusiasms. Thousands of school children pour through our exhibit halls every year; hundreds have taken the further step, impelled by their natural curiosity about natural things, which so often leads them into our Student Section and the wonderful pleasures of collecting and observing, even into significant research projects. This education out of school – the highest kind because it works from free response to inner drives – is one of the Academy's chief reasons for being. The Director, Dr. Robert C. Miller, once said something like this in an Annual Report: "The Most Important Visitor to the Academy is a freckle-faced boy with a frog in his pocket." And important as its own research programs are, along with the maintenance and increase of vast study collections for the use of advanced specialists all over the world, no greater satisfaction comes to the Academy – to the men and women who form its policies and guide its destiny – than that of seeing one of these boys or girls become, in maturity, recognized for his own contributions to science, or just become a well rounded adult happy with an absorbing and constructive interest for his leisure time. At this moment, we would like to express the Academy's satisfaction in knowing that a one-time Student Member is now a full-fledged scientist with an IGY base party in Antarctica, not forgetting that back of *him* are not only the Academy but. even more important, a wise mother and father who encouraged in him the bents that put him on the way to more than ordinary goals in life.

PD'S AUTHORS

A FORMER SAN FRANCISCAN who has traveled widely about the world, **Ernest K. Allen** is retired, lives and writes in Pasadena. He is well acquainted with the Columbia from its mouth to beyond The Dalles. . . .¶ One-time curator at the San Diego Zoo, **Ken Stott, Jr.** now lives in Spring Valley, California. . . .¶ San Francisco-born, Lowell High graduate, 23-year-old **J. McKim Malville** took a B.S. degree in physics in June 1956 at California Institute of Technology, where a wise professor urged him to go where his curiosity pointed him, to Antarctica – graduate studies could wait. His article came up from the Weddell Sea with the landing party's last mail in February; the next installment will have to wait until early in 1958. Meanwhile, he has been in speaking contact by radio with his parents in San Francisco. . . .¶ **Charles and Patricia Vaurie** are associated with the American Museum of Natural History, New York. Mr. Vaurie is well known in coleopterological circles. . . .¶ The ornithologist **Dr. Ernest P. Edwards** has recently been appointed Assistant Director of The Museum of Natural History of Houston. . . .¶ From Greenville, in northern California, **Philip Hyde** follows science and outdoor stories with typewriter and camera both, in his hands an effective combination. . . .¶ **Charles F. Hagar** joined the Morrison Planetarium staff in July, coming to the Academy from Griffith Observatory and Planetarium in Los Angeles. Good luck to Leon Salanave, who vacated the position to work afield for the University of Michigan searching for a solar observatory site. D.G.K.

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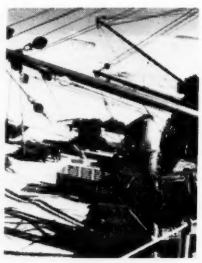

THE COVER

WEDDELL SEA TASK FORCE unloading for the U. S. Ellsworth Station of the IGY. Photo by J. McKim Malville of San Francisco. (See page 14.)

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EDITORIAL

The IGY and Antarctica's Challenge

ANTARCTICA'S ice pack twice barred the greatest of seagoing explorers, Captain James Cook, from the discovery of her continental mainland. In 1773 and 1774 his ships *Resolution* and *Adventure* sailed well below 65°S – their farthest south, 71°10′; but the Seventh Continent hid her icy face behind a curtain of fog and snow, not to show it to man for another half century. After discovering South Georgia and running afoul of the Antarctic ice pack, Cook wrote in his journal as he turned northward again:

"Countries condemned to everlasting rigidity by Nature, never to yield to the warmth of the sun, for whose wild and desolate aspect I find no words: such are the countries we have discovered; what then may those resemble which lie still further south . . . should any possess the resolution and fortitude to elucidate this point only by pushing yet further south than I have done, I shall not envy him the fame of his discovery, but I make bold to declare that the world will derive no benefit from it."

Now, almost two centuries after Cook, the world is staging its third International Geophysical Year; and it is putting its main all-out effort, not as in the first two (First International Polar Year 1882-83, Second International Polar Year 1932-33) into Arctic exploration and studies, but into a concerted, determined cracking of the last unknowns and mysteries of the Antarctic continent. The earth satellite project, oceanographic investigations, and many other activities of world import are of course vital parts of the whole; but Antarctica is this time the capstone to an overarching assault on the stubbornest secrets of our planet.

To refresh the memory of what most of us have read in the papers this last half year and more prior to the official opening of the 18-month IGY on 1 July 1957, we quote from Rear Admiral George J. Dufek's book *Operation Deepfreeze* published this spring: "The IGY 1957-58 is by far the largest joint enterprise ever undertaken by scientists. During the detailed examination of the planet, simultaneous studies and observations are to be made of all the land masses and seas, and from the surface of the lands and bottom of the oceans to a hundred and more miles into the atmosphere.

"Scientists will study solar activity, longitude and latitude, glaciology, oceanography, meteorology, geomagnetism, aurora and air glow, ionospheric physics, seismology and gravity, cosmic rays, and upper atmospheric rocket exploration, including the use of instrumented satellite vehicles."

What is the tremendous importance of the Antarctic in this program? We turn to the official monographic "handbook for members of the IGY Antarctic staff," *Antarctica in the International Geophysical Year:* "From the beginning, the Antarctic has played a very important part in plans for the IGY. There are a number of reasons why observations on the Antarctic continent have an exceptional value in geophysical studies. . . . There are, of course, certain observations that can only be made in the polar regions. Proximity to the south magnetic pole permits important observations of geomagnetic phenomena, not possible elsewhere. Also, since the lines of force of the Earth's magnetic field are perpendicular to the surface of the Earth at the magnetic poles, more cosmic rays reach the Earth's surface there than anywhere else, permitting unique observations. The aurorae, too, are polar phenomena. The United States stations in Antarctica, located near the edge of the southern auroral belt or within it, will be ideally located for observations of the Aurora Australis. [Aurora observation is the chief assignment of the young geophysicist J. McKim Malville at the U. S. "Ellsworth" Antarctic station, whose article "Men and Ships Against Weddell Sea" appears in this issue.] . . .

"The Antarctic is obviously a primary source of data for the glaciologist, since it is the largest single repository of ice and snow on the surface of the Earth. Studies of successive layers of Antarctic ice can tell us much about the climatic history of the Earth and, more important, will reveal much about our changing climate and environment at the present time.

"The Antarctic is believed by some to be a breeding place of the world's weather. The furious storms of the Antarctic winter are probably a major factor in determining the weather of the whole Southern Hemisphere, and their effects even appear to extend across the equator into the Northern Hemisphere. Observers at Antarctic stations will have an invaluable opportunity to study this weather in the making, to follow movements of the atmosphere, and to relate these to the weather in other and distant regions.

"Finally, the absence of the Sun during the long polar night also has its effects on the ionosphere. Radiation from the Sun, specifically ultraviolet and x-radiation, breaks up the atoms and molecules in the upper atmosphere into electrons and positive ions. These electrically charged particles, in effect, make a mirror of the ionosphere, so that it reflects back radio signals. In the long Antarctic night, however, particularly at the South Pole itself, the Sun's radiation is absent, and this gives rise to the important question of the composition and characteristics of the ionosphere under those unique and interesting conditions." These are the words of Dr. Joseph Kaplan of the University of California, Los Angeles, chairman of the U. S. National Committee for the IGY.

Picture, then, eleven nations operating no fewer than thirty-seven stations on Antarctica, its sea-riding ice shelves, and its adjacent islands, for two consecutive years. As this is written, some seventy American scientists and their large supporting crews are dug in, in six stations including one at the South Pole itself, for that long Antarctic night – not merely waiting for

the crucial coming polar summer of 1957-58, but making the most of darkness, the long dark of the ends of the earth, fraught with its own mysteries.

So it is a vast testing ground for science, a continent-sized laboratory, where all manner of complex and precise instruments under highly trained hands and eyes and minds will capture and order a great array of facts, to the end that the world will derive some benefit from it, if only that of knowing. James Cook and his times were too early even to guess wildly what these last frozen frontiers hid from the human mind, although the challenge of finding for the sake of knowing sent them to the edge. But James Cook and his forerunning and following generations of explorers did know that man *must* venture for ever into the unknown, where ever it might lead him, and that venturing was a sufficient end to call forth every faculty of mind and body and spirit for the acceptance of its challenge. And it still is. Richard Evelyn Byrd was of the breed of James Cook. An educated scientist of his times, Cook knew nothing of the ionosphere or cosmic rays, but he knew the face of danger and how to look on it calmly and resolutely; he knew the tingling invitation of the unknown and how to accept it eagerly. He would gladly have handed his explorer's torch, as he looked unflinchingly on his last, fatal, danger, on to a Richard Byrd, as his spiritual descendant, or to a Robert Scott, an Ernest Shackleton, a Douglas Mawson. These men came to Antarctica equipped both with the spirit of adventure and with some of the ideas of modern science. They, and their followers across the ice shelves, brought a new train of values to Antarctica.

Besides the quite compatible values of science and adventure, there are others to weigh in reckoning possible benefits the world will derive from Antarctica. One of these, the political or territorial, has its roots in the first sightings of Antarctica's coastal islands in 1820 and the world's first intimations of new lands to conquer here. "Who discovered Antarctica?" asks the New Zealand author Norman Kemp, whose book *The Conquest of the Antarctic* opened with the passage, in the version quoted above, from Cook's journal, "—Bransfield or Palmer? No definite decision is possible, but the problem is more than an academic enigma for historians, for it has a direct relationship to the conduct of the nations which today quarrel over its possession." Enter another pair of values, the strategic and the economic. Upon the groundwork laid by discoverers and explorers, the world has begun a new phase in its relations to Antarctica. Here is a brand new continent for us to exploit, our last on earth. What are we going to do with it?

Totally in the grip of an Ice Age, the Seventh Continent is not for human settlement, nor will it in the foreseeable future afford more than transient habitation with every necessity of life, except air and water, being brought in across an ocean. Yet nations claim territory here – sectors of largely undefined and unapproachable coastline backed by pristine rock itself almost wholly buried under ice to depths of two miles. There are no "hidden valleys" of temperate clime; there is no soil to grow anything in, nor has there been found sufficient evidence of available mineral wealth to get excited about (plants there were in a geologic past, fossils show, and a vast amount of coal is postulated, but the world is quitting the coal age). Yet within the decade warships have bristled at each other in Antarctic waters. Chile, Argentina, and Britain all claim strategic interest in the Palmer Peninsula which thrusts toward Cape Horn. Home offices have accused each other's shore stations of claim-jumping and relations have cooled like an Antarctic blizzard. Some quarters have viewed with distinct alarm the recent large-scale operations – Highjump – Deepfreeze – carried out by U. S. armed forces, primarily for science we have assured the world, but also undeniably in part to test military equipment designed for polar conditions. (It should be recalled here that while the U.S. has abundantly paved the way for eventual territorial claims, it has so far neither made any officially nor recognized those of other nations.)

With nations jockeying for strategic and possible economic advantage, according to the old rules of priority and power, is there a bright side to the Antarctic picture? We think there is. Explorers and scientists see it, and all who are bent on peaceful progress in world development. It is their hope that those in political control of the origins of events will see it, and accordingly act in the best interests of all men.

If there is anything in sight to give some assurance of a peacefully purposeful future for Antarctica, it is that which the present IGY activities are bringing into

"I know of nothing more fascinating than to watch these rookeries of king penguins," Dr. André Migot says in his account of a year on remote Kerguelen Island, entitled *Thin Edge of the World.* (Photo courtesy Little, Brown & Company, Boston)

full view. It is the possibility that in Antarctica men and nations can and will meet in joint and friendly seeking for the higher uses of earth's last terrestrial prize, forswearing the baser. Strategically it could be a big thing, but only to one dominant nation—two would presumably neutralize each other. Economically, it's for the birds – nobody but a penguin can make a decent living there. So back to science and adventure.

Science is in full swing in Antarctica, as we have noted, with the IGY; and there is still plenty of room there for men to exercise the need to explore (along with the ocean depths, Antarctica may well satisfy this need until we are ready to try for the moon!). This is the hope that an Australian, Arthur Scholes, sees, in his book *Seventh Continent:*

So long as there is any part of the continent still undiscovered, there will be men who want to go there. Antarctica, sinister and beautiful, has little natural wealth. . . . (It) is the field for the adventurer. . . . Its real secret lies hidden in the wind and rocks, for the more we can learn of its strange geological history, the more we will know of the history of the globe. . . . The search in Antarctica will go on as long as man is on the earth, until every glacier, every mountain and every valley has been mapped and plotted. . . . Possibly one day this great land might be used as a store-house for surplus crops [Byrd, too, had this vision]. . . . These are speculations of the future, and all those associated with the exploration of Antarctica hope it will be a peaceful one.

How can nationalistic trends be stopped? In *Quest for a Continent* the American journalist Walter Sullivan reports:

With the current parade of expeditions to Antarctica, the idea of United Nations control is gaining ground. . . . Edward Shackleton, son of the man who blazed the trail to the South Pole and an explorer in his own right, wrote in backing international rule, "We need not fear that we are betraying the great explorers of the past, for they sought nobler goals than the mere expansion of national territory." . . . The International Geophysical Year is in itself a step in the direction of international control. If it can be carried out without friction, despite rival ideologies, it will show that such a solution is feasible – a solution which . . . would be appropriate to the ideals of the Antarctic heroes . . .

Nationalistic pride has become too dangerous, too lethal. Antarctica could be the rock on which to break it, the remaining place on earth where mankind could achieve new stature in the abrogation of senseless pride. This might be the greatest of all benefits which the world will derive from Antarctica. D.G.K.

Antarctic reading

Thin Edge of the World. By André Migot. Little, Brown and Company, Boston. 1956. 242 pp., 16 photos, 2 maps. $4.50.

A French physician and biologist, André Migot, volunteered for a year's service on Kerguelen Island in the south Indian Ocean where its waters become Antarctic. Something of a mystic, the doctor had several motives: he sought solitude, which he found on walks away from the cabined island community; he was interested in the psychology of men confined together for a lengthy period in a place far off from other human society; he is a keen student of wildlife, and found much to observe on Kerguelen; and he had wanted for years to go to Antarctica. The chance for this last came when an Australian expedition stopped en route to the Antarctic Mac-Robertson Coast and Dr. Migot went along as invited French observer. This book of a gifted and sensitive man, who can both enter into action wholeheartedly and at the same time look at it detachedly, makes an excellent introduction to the Antarctic.

Seventh Continent: *Saga of Australasian Exploration in Antarctica 1895–1950.* By Arthur Scholes. The British Book Centre Inc., New York. (1956.) 226 pp., 17 photos, 3 maps. $4.50.

Veteran of two Antarctic expeditions and a very competent writer, Arthur Scholes has contributed much to a balanced picture of man on the Seventh Continent by recounting in detail the explorations of Sir Douglas Mawson, Sir Hubert Wilkins, John Rymill, and others of their countrymen, who yield to no one in the caliber of their exploints.

Two Years in the Antarctic. By E. W. Kevin Walton. Philosophical Library, New York. 1955. 194 pp., 29 photos, 6 line figs., maps. $4.75.

Kevin Walton's is a personal narrative of field work in Antarctica, that of the Falkland Islands Dependencies Survey. Besides the intimate pictures of life as men live it during prolonged Antarctic stays, this young Briton also gives a very frank and sympathetic account of friendly internatinonal coöperation, not entirely without friction, after his party threw in with an American group under Finn Ronne's command, for mutual support. Walton has the attributes of a first-rank explorer and is a gifted writer.

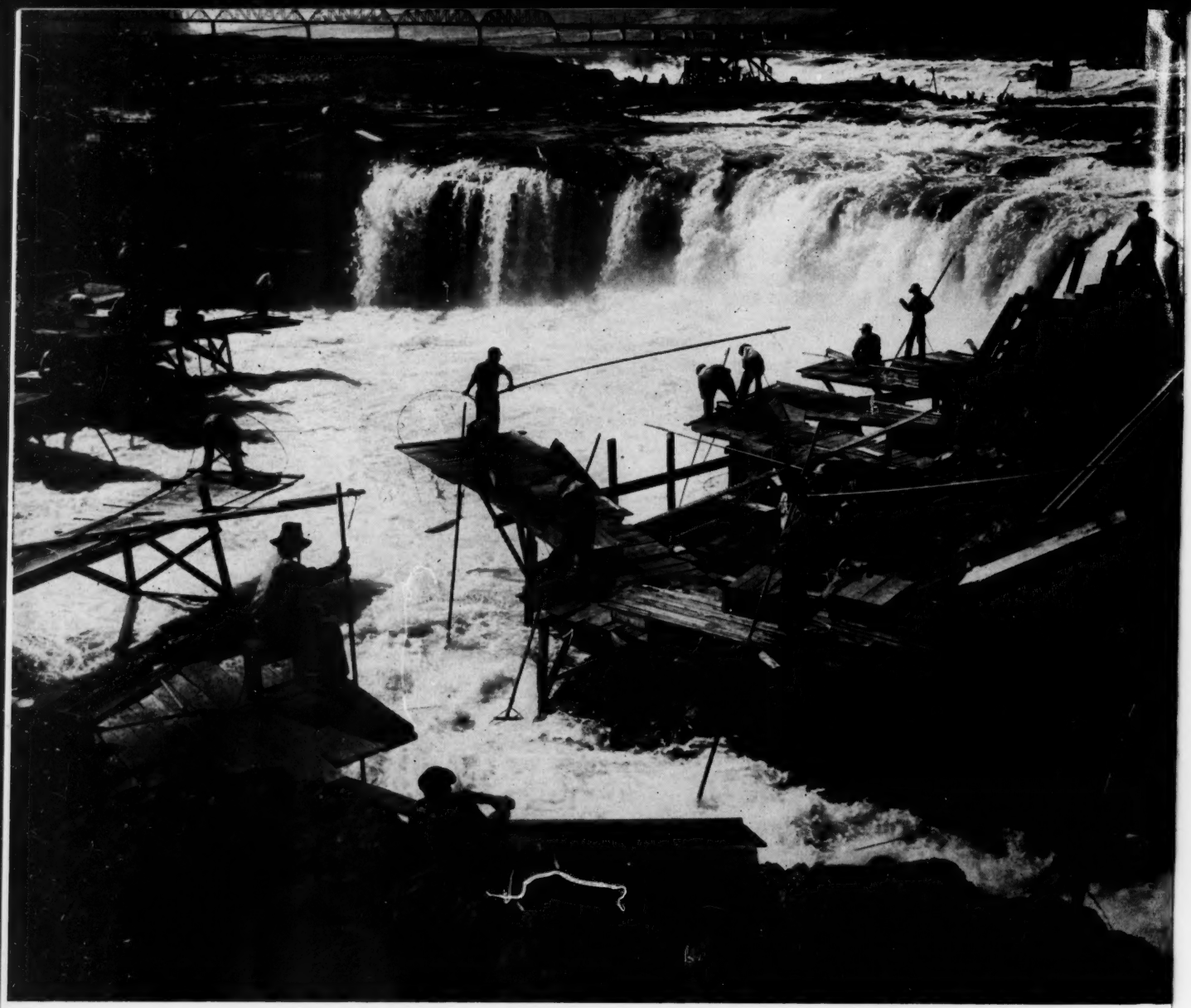
The Conquest of the Antarctic. By Norman Kemp. Philosophical Library, Inc., New York. 1957. 152 pp., 27 photos. $4.75.

In writing this book to give his fellow New Zealanders some background for an appreciation of the forthcoming British attempt to cross Antarctica via the Pole for the first time on land, as part of the work of the IGY, Norman Kemp has retold in detail the epic Weddell Sea story of Shackleton's party in 1915-16; Mawson's ill-fated Adélie Land journey of 1912-13; in brief, the stories of America's Operation Deepfreeze and of the Royal Society station at Halley Bay; and especially the work of Dr. Vivian Fuchs, the English scientist-explorer who will lead the dog-sledge and tractor party from the Weddell Sea to meet somewhere near the Pole the New Zealand supporting group under Sir Edmund Hillary.

Quest for a Continent. By Walter Sullivan. McGraw-Hill Book Company, Inc., New York. 1957. xiv + 372 pp., 31 photos, 5 maps. $5.50.

In what has been called the best of current books on Antarctica, which are filling a demand created by the IGY program, the *New York Times* correspondent Walter Sullivan relates the stories of discovery and early exploration before taking up at length the large-scale accomplishments which began with Byrd's expeditions and are culminating in those of the IGY. Here are the stories of the U. S. Antarctic Service, the colossal U. S. Navy Operation Highjump, including Operation Windmill, and, briefly, that of Operation Deepfreeze as lead-off to IGY activities. There is a timely section on "Antarctic colonialism."

(Continued on inside back cover)



"Here is **THE GREAT FISHING-PLACE**

of the Columbia" Lewis and Clark wrote in their journal a hundred and fifty years ago—

but this year, after countless generations of the salmon run, The Dalles Dam has sent Indian fishermen away from drowned Celilo Falls forever

ERNEST K. ALLEN

WHEN LEWIS AND CLARK, more than 150 years ago, reached the eastern end of the Columbia River Gorge some 15 or 16 miles above the present site of The Dalles, Oregon, they observed an Indian village of considerable size on the north bank of the river near Celilo Falls. The Indians called the village Wisram, or Wishram. The members of the expedition were greatly interested in their method of fishing for salmon in the whirlpools and rapids below the falls, and Lewis and Clark described the place at some length in their journal.

For countless generations the Indians had been fishing there during each season's run of salmon, and until a few months ago they continued to do so in almost exactly the way that Lewis and Clark described. For in 1855, after several Indian uprisings against the whites had been suppressed, our Government made a treaty of peace with the Indians in which they were given the exclusive fishing rights for a stretch of the river 11 miles long including Celilo Falls and the rapids below. Since then none but Indians have been allowed to fish there.

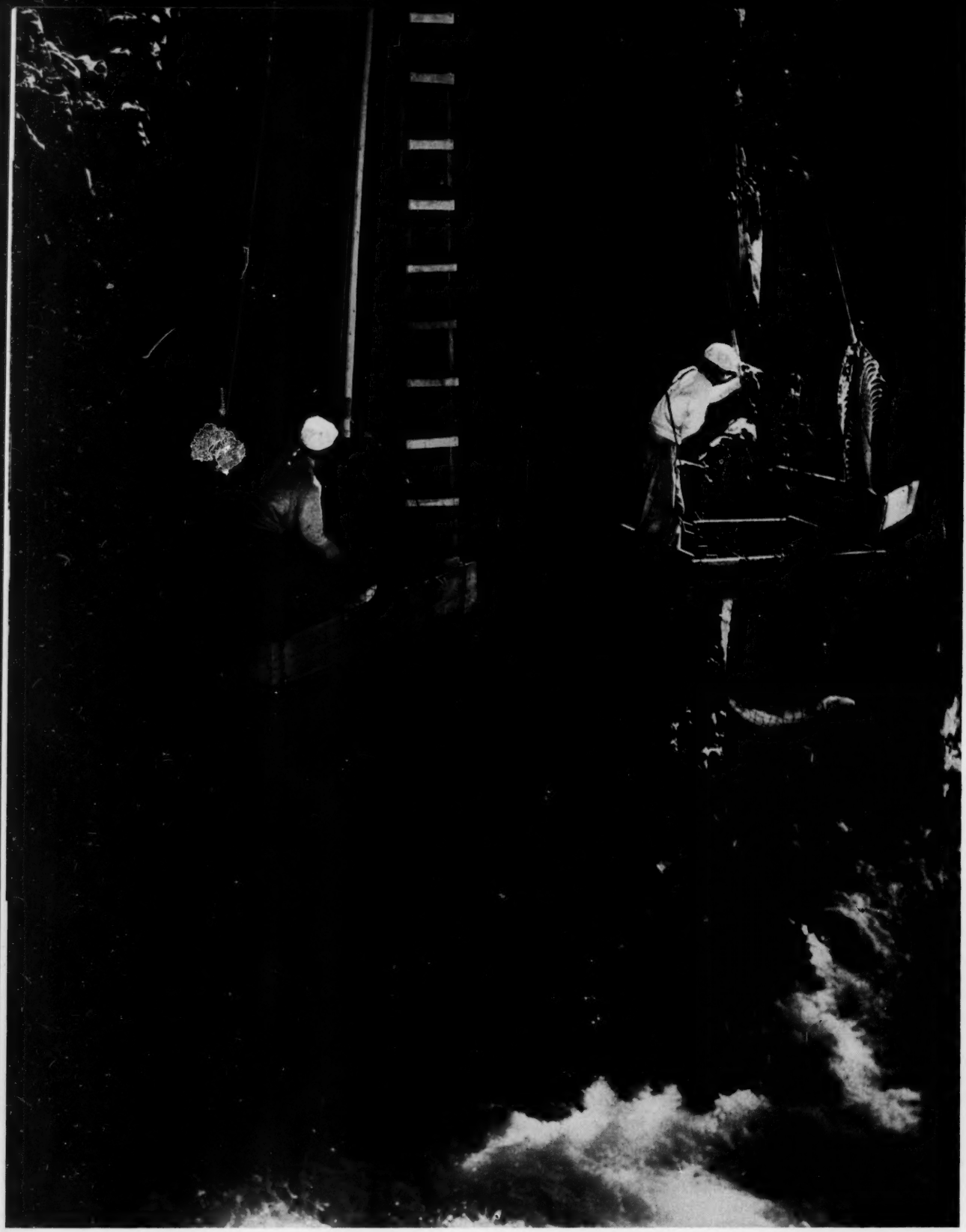
But the picturesque and interesting sight of the Indians fishing at Celilo Falls, from crude wooden platforms suspended 10 or 12 feet above the swirling rapids, is now a thing of the past. The latest dam on the Columbia River, now under construction a few miles upstream from The Dalles, will soon cause these historic fishing grounds to be inundated. The last Indian fishing was finished at the end of the fall salmon run in September 1956, and The Dalles Dam Lake is covering the falls and rapids in the spring and summer of 1957 as it backs up behind the 88-foot dam.

The building of The Dalles Dam and accompanying power plants, while important to the economy of the Columbia River Basin, is a real tragedy to the Indians. They vigorously opposed the destruction of their ancestral fishing grounds, for the fish caught there were important to them as food. But the U. S. Government has agreed to pay the Indians more than 20 million dollars for tribal rights confirmed in the treaty of 1855. The tribes concerned include the Yakimas, Klickitats, Umatillas, and several others now living at considerable distances from the area but which had fishing rights at Celilo under the treaty.

The Indian village of Wishram has long since disappeared, and of late years the fishing has mostly been done on the south bank or Oregon side of the river and from an island of lava rock in the middle of the rapids. The last time this writer visited the spot, during a fall salmon run, there were perhaps two hundred Indians there, some from the area within a radius of 50 or 60 miles from Celilo, some from as far away as Idaho, and others from various parts of eastern Oregon as far south as Klamath Lake. Many were fishing with nets on the ends of long poles, and some with spears. Others on the bank were cleaning and preparing the fish for curing in smoke-ovens they had built of rocks, in which great quantities of the fish were already being smoked. We wanted to buy a freshly caught salmon, but although the Indians were very friendly they told us it was unlawful for them to sell the fish to white people, the law being that the fish caught there were to augment the food supply of the Indians and not to be sold commercially.

The scene at Celilo Falls during the Indian fishing season has attracted the attention of travelers passing that way since the days of the early explorers, but most modern tourists who have stopped there briefly while driving along the Columbia River Highway are probably unaware of the historic significance of this place. According to observations made by Lewis and Clark, the Indians of the Wishram area belonged to a tribe whose language and ways of living were very different from those of the lower Columbia. Instead of the tepee, these Indians had houses of wood split from

Indian fishermen exploited various means to reach with nets and spears the salmon crowding upstream in the plunging waters at Celilo Falls. (All pictures from Photo-Art Commercial Studios, Portland)

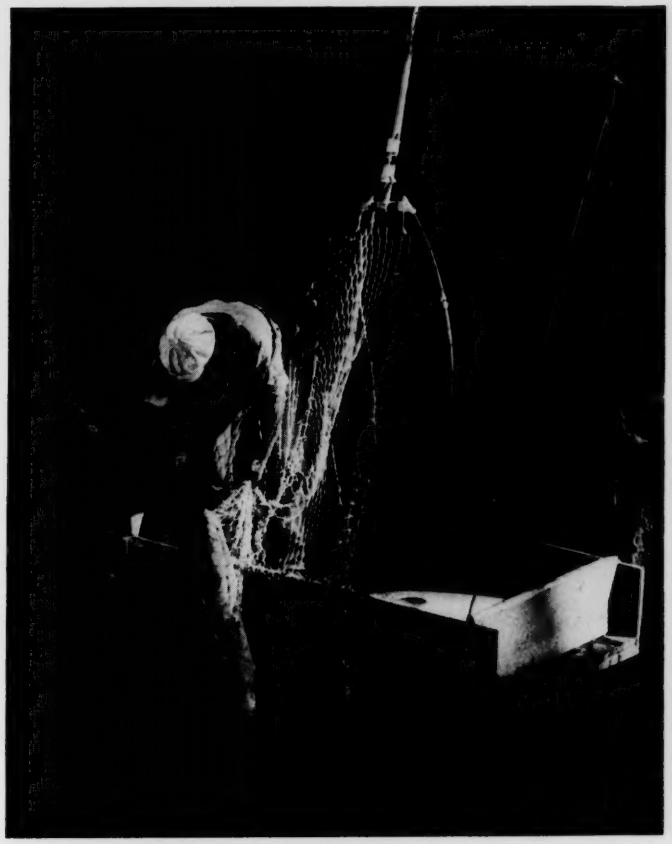


Risky business — hanging from the cliff or standing on his platform over the rapids, every fisherman has a safety line around his waist.

the trunks of cedar trees with implements of bone and stone, and thatched with cedar bark, and they had a more advanced culture in many ways.

Wishram was one of the best fishing places on the river, owing to its location at the head of the narrows; but the feature which especially interested the early explorers was the system of barter carried on by the tribes which met there annually to trade and visit. Wishram in those early days was the trading mart of the great river. Here came the tribes from the mouth of the Columbia, with salt, dried oysters and clams, with fish from the seacoast, with berries and roots, and beads and trinkets obtained from white traders along the coast. The Rocky Mountain tribes brought commodities from the plains and prairies, horses, buffalo robes, quamash, flint, bear-grass and reeds for making baskets and mats, and other articles of trade. And the fishermen at Wishram had great quantities of dried salmon to trade for these commodities from the east and west, besides acting as middlemen for the tribes from up and down the river. Lewis and Clark wrote in their journal:

> Here is the great fishing-place of the Columbia. In the Spring and Summer, when the water is high, the salmon ascend the river in incredible numbers. As they pass through the narrow strait of the Long Narrows below the falls, the Indians, standing on the rocks or on wooden stages projecting from the banks, scoop them up with small nets distended on wooden hoops and attached to long poles, and cast them on the shore.
>
> The fish are then cured and packed in a peculiar manner, first exposed to the sun on scaffolds erected on the river banks. When sufficiently dried they are pounded fine between two stones, pressed into the smallest compass, and packed in baskets or bales of grass-matting about two feet long and one in diameter, lined with the cured skin of a salmon. The top is likewise covered with fish skins, secured by cord passing through holes made in the edge of the basket.
>
> Packages are then made, each containing twelve of these bales, seven at bottom, five at top, pressed close to each other, with the corded side upward, wrapped in a grass mat and corded. These are placed in dry situations and again covered with matting. Each of these packages contains from ninety to one hundred pounds of dried fish, which in this state will keep sound for several years.



▲ A salmon is quickly dispatched with a club.
▼ As the big fish are landed, women gather them for cleaning, smoke-drying, and preparing the bundles to store for future use.

On the north bank of the Columbia near the village of Wishram, Lewis and Clark found a great mound of earth which they said "had every appearance of being artificial." In the last few years

Indian shanty at Spearfish, one of the villages now disappearing from the vicinity of Celilo Falls.

a careful investigation of this mound has been made by archeologists and students of anthropology. Here were found implements of bone and stone, charcoal and ashes from ancient camp fires, arrow heads, fluted spear points and various other artifacts, some of which were very old. In recent months these scientists, working against time to complete their investigations before the area is inundated by the new Dalles Lake, have discovered evidences of an early culture which flourished in

"Les Dalles of the Columbia River," drawn by Henry James Warre. An illustration from *The Fur Hunters of the Far West* by Alexander Ross (reviewed in this issue). (Courtesy Yale University Library and the University of Oklahoma Press)

Aerial view of The Dalles Dam and Lake on the Columbia River. Celilo Falls was upstream, around the bend.

this area several thousand years ago, traces of which have persisted to the present time.

At the time the railroad was completed along the north bank of the Columbia River in 1906, a siding was established near the site of the old fishing village. The railroad company built a station there which they called Spedis, for an Indian patriarch, Bill Spedis, whom they liked and found interesting. He was a lineal descendant of a chief of the Wishrams. But old-time residents of Klickitat County objected to having the name of the village changed, and asked the railroad company to change the name of the station to Wishram, which was done shortly after. Today the principal feature of interest in the neighborhood is a large petroglyph about six feet in diameter incised in the surface of a flat lava rock in the face of the cliff not far from the site of the old fishing village. The meaning and origin of this ancient petroglyph are unknown, but many years ago some of the oldest Indians said that according to the tradition handed down by their ancestors the meaning of the inscription is "She who watches you as you pass by." How many hundreds of years she has watched, no one has any idea. But the passing scene today bears no resemblance to the world she knew.

HUMBOLDT PENGUINS THE CHILD BIRDS OF PUCUSANA

KEN STOTT, JR.

AS THE SKIFF sputtered away from the dock, we shrank into our coats and tried to ignore the bitter sharpness of the wind. Behind us Pucusana's huts lay scattered along a curve of shoreline. Beyond the village, barren foothills climbed abruptly, and in front of it tiny fishing boats tugged at their moorings in the bay.

Perhaps when washed with sunlight, the scene might have had its gentler aspects, but today as on most days the *garua,* a shroud of mist, sagged down from the leaden sky to give the village and its desert setting a gray, bleak look. It seemed impossible that only a couple of thousand feet overhead, above the *garua,* a near-equatorial sun blazed down, that to the east the Peruvian Andes jutted into a clear, blue sky.

The skiff was now picking its way toward the open sea which lay beyond a point of land to the north. From time to time Cesar, the boatman, pointed skyward and called happily, "You *seee* the *burrrd?*" Cesar knew that the *burrrds* were what we had come to see. Sometimes he indicated a frenzied flock of gray gulls or a cluster of white-mustachioed Inca terns. Or perhaps he pointed out a wavering column of Guanay cormorants with a few Piquero boobies tagging along.

Once we rounded the point, the boat began to pitch, and the horizon danced crazily. At last we were adventuring in the churning, frigid waters of the Humboldt Current.

When next Cesar sang out "You *seee* the burrrd?" there was an eagerness in his voice that connoted something special. And special they were – four little surf sprites bobbing through the waves. They were our first wild penguins, and surely they alone were worth the trip to Peru.

All four were paddling briskly about, constantly turning their glistening black heads from side

Humboldt penguins. (San Diego Zoo photo)

to side. Unmindful of the rough seas, they seemed as serene as swans on the village pond. As if by signal, they plunged their faces in unison beneath the surface. Now as they swam, they scanned the depths in search of suitable snacks. Suddenly they submerged entirely, their dark bodies darting along like torpedoes a few inches beneath the surface. Five feet ahead of them a silvery shower of frightened fishes exploded from the water and shimmered through the air. When their pursuers reappeared, each had a wiggling anchovy in its beak.

With appetites momentarily appeased, the penguins began to swim again, this time rolling in and out of the surf like playing dolphins. Then abruptly they brought their acrobatics to a halt. They had apparently seen us for the first time. Now they paddled slowly and sedately, eyeing us with suspicion.

As they waited quietly for our next move, they bore a markedly human quality. *Pajaros niños* is what Peruvians call the penguins and so these seemed — *child birds,* swimming aimlessly about while waiting for a word from the grownups.

They were Humboldt penguins, members of the *Spheniscus* group whose four species are often termed "temperate zone penguins." Of the other three kinds, one likewise inhabits South America, a second South Africa, and the third the Galápagos Islands. The Galápagos species, incidentally, is the only one of the 17 kinds of penguin that has ever been recorded in the wild state north of the Equator, which the Galápagos archipelago straddles.

Evidently, the Humboldt penguin can thank the northbound Humboldt Current for its present distribution. This representative of a customarily cold-country family now lives far from its ancestral home in the south. It may be found from Tierra del Fuego north to northern Peru, its range ceasing where the Humboldt Current swerves westward away from the South American coast.

The four swimming *pajaros niños* gradually seemed to conclude we were harmless. Or perhaps it was merely that a discordant blast from shore diverted their attention. To us, it was a prolonged honking, a strident and unpleasant sound, but they responded enthusiastically. They replied in like manner, braying lustily like sea-borne donkeys.

The call from the shore emanated from a fat little gnome that stood perched atop a pointed rock several feet above the surface of the waves. Here was a chance to see what the child bird looked like out of the water, so we asked Cesar to pilot us nearer to it.

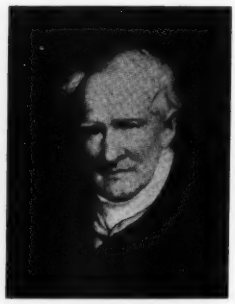
The penguin stood approximately two feet high, and it was safe to assume he weighed somewhere around the nine pounds that is average for the species. We referred to it as "he" although we could easily have been mistaken; there are no obvious external criteria for determining gender in Humboldt penguins.

The glossy condition of this fellow's plumage suggested that he had recently completed his moult. But a few weeks earlier he had undoubtedly been the picture of dejection as he waited, forlorn, shivering, and ruffled up, for his worn plumage to drop out. Nothing in the world is more unattractively pathetic than a moulting penguin; its feathers drop out unevenly and in great wads, giving the victim a leprous appearance. Throughout the moulting period the penguin stands and suffers; either he cannot or will not swim at the time, so he must go hungry as the ocean is his pantry. All the while he looks dreadfully sorry for himself. Then when finally the last of last season's feathers are divested, he promptly emerges from his lethargy, brays joyfully, decides that life after all is a glorious thing, and sets off to sea to gorge himself. In no time at all, he is plump and his old noisy nimble self again.

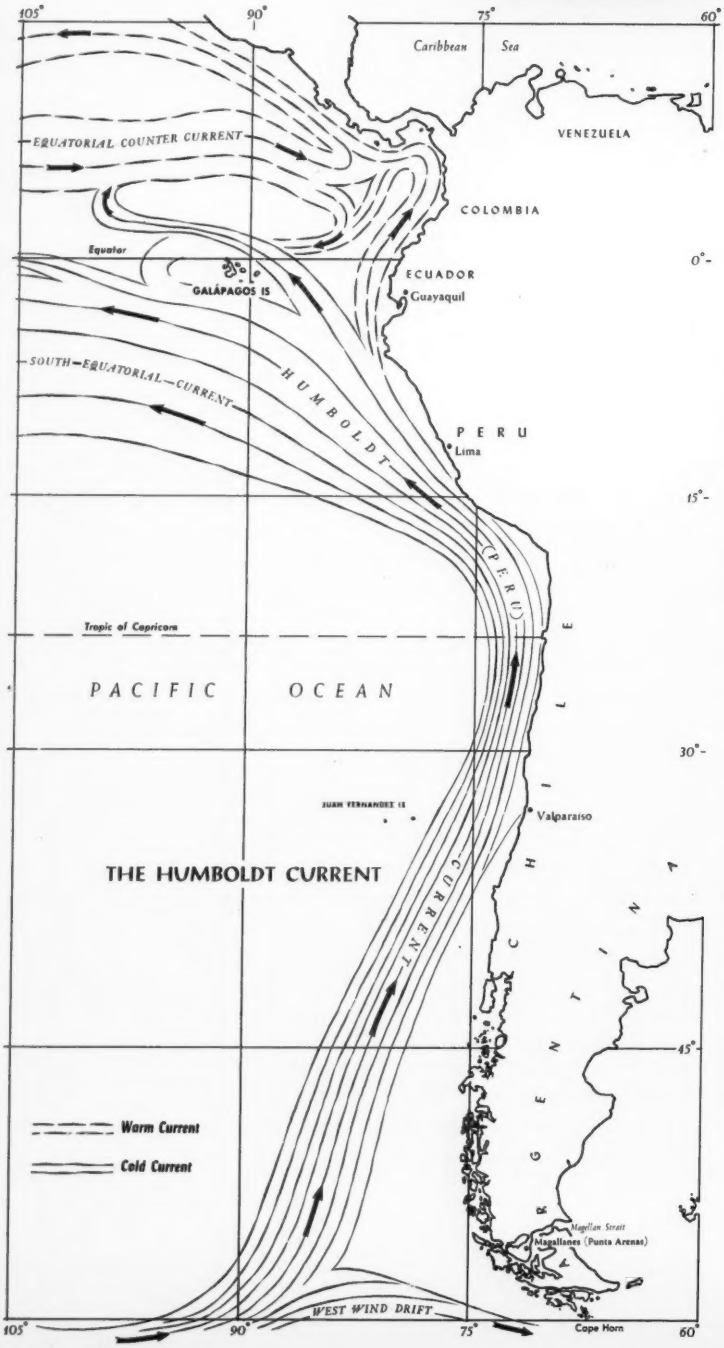
Just before moulting, the dark parts of a penguin's plumage are gray and lusterless. Afterward they are almost black and offer sharp contrast to the white of the undersides, chestband, and facial crescents. The penguin now before us looked so crisply piebald as to have been recently starched and laundered.

The only expanse on his entire body that was neither blackish nor whitish was located at the base of his bill just in front of the eyes: a pink, fleshy, swollen area that indicated that for this penguin the breeding season was not far off. The beak itself, a thick blunt instrument about three inches long, was black with blue-gray spots, two of which formed a pale transverse band near the tip. His oversized webbed feet were blackish brown, and his eyes were reddish brown with flesh-colored rims. The wings, useless as flight organs but splendidly functional for swimming, were mainly dark above, and light beneath.

All the while we had been watching friend child bird, Cesar had been moving the boat closer



The Humboldt Current and the great scientist for whom it was named. The chart is modified from data in *The Oxford Advanced Atlas*, 1940 edition. The portrait of Alexander von Humboldt, of which part is reproduced here, appears in *Humboldt*, a biography by Helmut de Terra (Alfred A. Knopf, New York, 1955).



and closer to the rocks. The penguin glared at us with growing alarm, and finally he must have decided our intentions were dishonorable. After shifting from foot to foot a couple of times, he plopped bill-first into the surf and disappeared.

The boat speeded up, and now we moved parallel to the rocks, just far enough from shore to avoid backwash from the waves as they pommeled the cliffs. We saw other penguins as we chugged along: most were fully adult, although we saw several that yet wore the dusky, unpatterned costume of the adolescent. These youngsters were grayish white below and whitish gray above. Of infants in soot-colored down, we saw none. Sometimes we saw single penguins, but more often they came in twos, threes, or fours. Never did we see more than a quartet at one time.

The days when penguins were common on the coast of Peru, if ever such a period existed, are long gone. Even on the guano islands offshore penguins are far from abundant. On a very few of these islands that extend irregularly from one end of Peru to the other, there are flocks of fair size, but on most the penguins are either scarce or have disappeared altogether. Along the mainland, they have nearly vanished.

The decrease in Peruvian penguins is due to a number of factors. Their natural enemies, particularly wild dogs on the mainland, discourage nesting except in the spots most inaccessible to non-aquatic beings, including the human. Penguin eggs and penguin oil are prized by mankind, and in the past the use of penguin skins for caps was popular. But man's greatest contribution to the decline of the Humboldt penguin flocks is the result of his digging activities on the guano islands.

Formerly, the surface of such an island, periphery included, was covered with natural fissures, caves and hollows, and even the nature of the surface itself was suited for the excavation of burrows. Now the guano crust is removed by man at regular intervals whenever and wherever its collection is commercially practicable. Thus the nesting habitat of the penguin has been drastically reduced, and there has been a corresponding decrease in number of eggs laid and hatched.

Humboldt penguins have no particular mating season. Man permitting, infants and juvenal-plumaged birds may be seen at any time of year. It is likely that some pairs of birds rear two sets of young within a twelve-month period.

In selecting a nursery, a pair of penguins may

prefer the privacy of a burrow which they alone occupy. On the other hand (or wing, if you prefer) they may choose to share their nesting site with several other pairs of birds. The female of each pair lays one, two, or perhaps three chalky, cream-colored eggs, and the incubation process lasts about a month with both parents sharing the task in 12-hour shifts.

Usually, nesting sites are chosen near the water, but this is merely a matter of convenience. Penguins can and do climb high up the slopes of the coasts they inhabit. They are also excellent jumpers, and we watched them hop from rock to rock with remarkable accuracy. Sometimes they dived into the sea from surprising heights, and obviously they enjoyed it. As they plummeted into the sea from the peak of a steep-sided rock, only to climb back onto shore, scramble up the rock, then plunge into the water again, we had no choice but to see the activity as just plain fun.

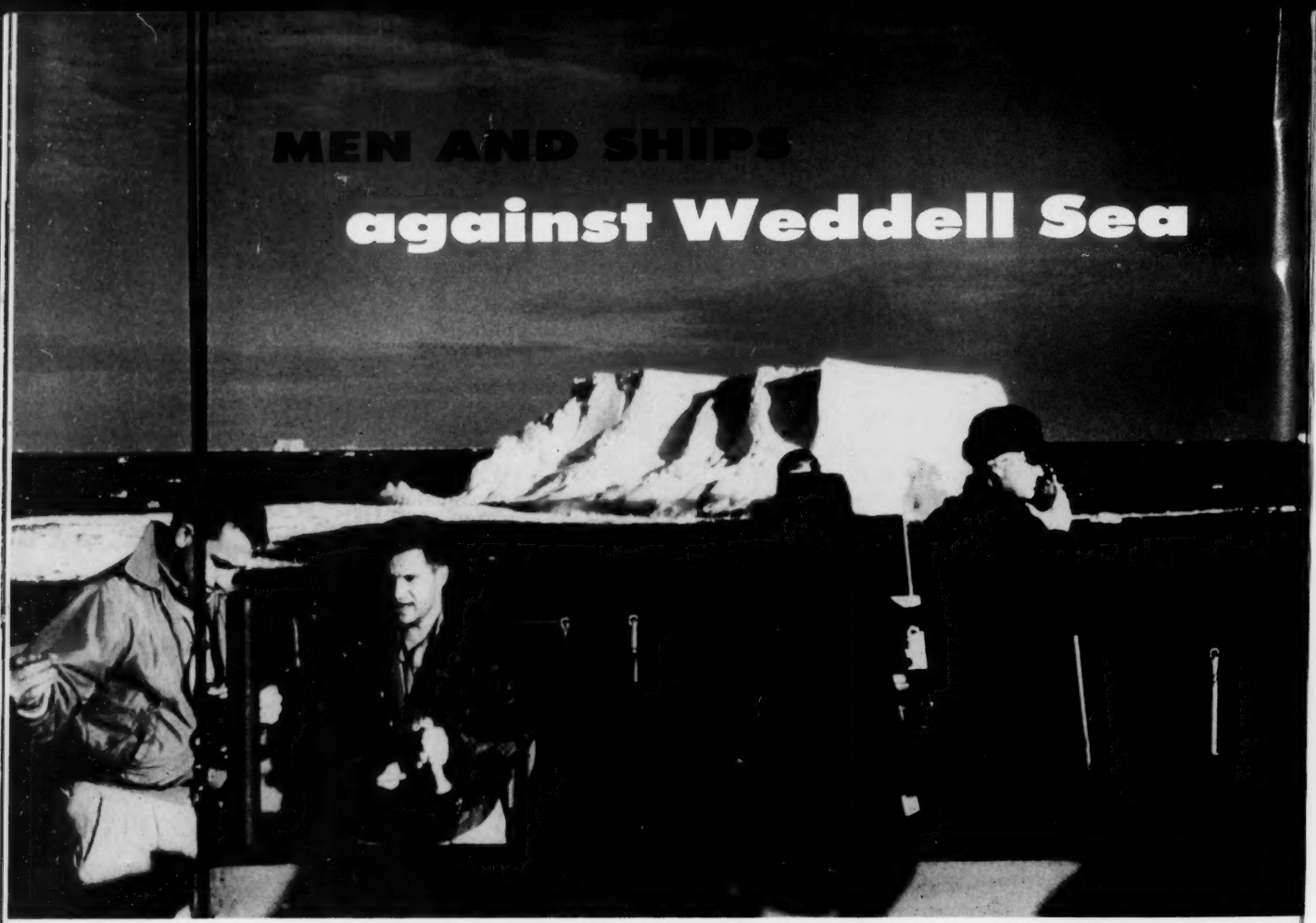
This proclivity for fun helps round out the character of a Humboldt penguin. Certainly the bird possesses qualities that are much less appealing. Not the least of these are its tendencies to mayhem.

Nipping appears to be a perverse sort of greeting among penguins. At least each relationship is begun so unpleasantly, so painfully, that it cannot help but improve. When one penguin marches through a group, he is snapped at and yapped at from every side, and should he somehow show he is not feeling quite up to par he can be sure to get at least twice as much biting as usual. The misery of a moulting bird is doubled by the painful attentions of its friends and family which seem to look upon the moulter's indisposition as a splendid opportunity to peck a fellow penguin without much danger of being pecked in return. On the rocks near Pucusana, we watched a couple of healthy penguins which seemed grimly determined to help a dying friend on its way as it lay suffering and helpless at their feet.

We were now inward bound, just rounding the point north of Pucusana. There on the mossy rocks stood a pair of penguins shaking their flippers and braying. Behind them, the western horizon glowed silver in the late afternoon. Our excursion was ending the way all proper trips should end according to travelogue tradition; the sun was sinking, the natives were waving goodbye, and from across the waters came the sound of the customary aloha — penguin version.

The author and a happy flock of Galápagos penguins. (San Diego Zoo photo by Van Nostrand)

MEN AND SHIPS against Weddell Sea



American scientists land on the world's remotest shore, to probe among Earth's last secrets during the International Geophysical Year

J. McKIM MALVILLE

THE WEDDELL SEA still presented in 1956 a challenging problem of Antarctic exploration. Ships had sailed along only a third of its coast line; the entire Filchner Ice Shelf had been seen only once from the air; and the country inland from the sea remained completely unexplored. In the spring of 1956 it was decided that as a part of the United States' participation in the International Geophysical Year, the Navy would establish a scientific station in the most inaccessible region of Weddell Sea. The base site was planned to be on the Bowman Peninsula (75°S, 62°W) where the southern end of the Palmer Peninsula meets the Filchner Ice Shelf. Captain Finn Ronne, veteran of three Antarctic expeditions, was chosen base leader, and from his 1947 flights over the Filchner Ice Shelf, open water was predicted between the shelf and the pack ice, allowing easy access to the base site. The base was planned to have nine scientists, with a total complement of thirty-nine men carrying out a full program of research for the IGY in the fields of glaciology, auroral physics, weather, geology, ionospheric physics, and seismology. Two ships, the USS *Staten Island,* a 10,000-horsepower windclass ice breaker, and the USS *Wyandot,* an arcticized cargo ship, were

Antarctica's Weddell Sea: from 1823 to the IGY—1957-58,—"unexplored, unknown, and mysterious"

Two GREAT indentations mar the otherwise circular outline of the world's highest, coldest, and most unexplored continent, Antarctica. These two great bodies of water, the Ross Sea facing New Zealand and the Weddell Sea facing the south Atlantic, shape the continent into an "east" and a "west" Antarctica. While the head of the Ross Sea was first reached as early as 1842 – and since then has been the center of the major efforts of the greatest Antarctic explorers, Shackleton, Scott, Amundsen, and Byrd–the Weddell Sea, though bordered on both sides by relatively well explored lands, on the east by Queen Maud Land and on the west by the Palmer Peninsula, itself remains unexplored, unknown, and mysterious. It has a reputation among whalers for unpredictable high winds, swift ocean currents, and dangerous fast freezes, and thus the "hell hole of the Antarctic" has remained both avoided and impenetrable.

The Weddell Sea carries the name of Captain James Weddell who in 1823 sailed in remarkably ice free waters to 73° south latitude; it still remains a mystery how Weddell could have penetrated so deeply into a sea which normally is surrounded by an ice pack extending north to latitude 60-65°.

The eastern edge of the sea was discovered by Dr. W. S. Bruce in 1904 as he sailed 250 miles along the coast line which he named Coats Land. However, it was not until 1912, some seventy years after Captain Ross reached the head of Ross Sea, that the southern edge of Weddell Sea was reached. The great Filchner Ice Shelf, extending across the southern boundary of Weddell Sea, was first sighted by Dr. Wilhelm Filchner from his ship *Deutschland* in January 1912. Hoping to carry out a broad scientific program, he set up his base in Vahsel Bay at 77°S, 34°W but soon after the construction of the base, the breaking off of an enormous extension of the ice shelf forced him to abandon both base and plans. He hastened to retreat from Weddell Sea, but in March his ship was frozen into the ice, not to be released until ten months later, 10 degrees in latitude to the north.

Two years later the Weddell Sea was again challenged, this time by one of the peers of Antarctic exploration, Sir Ernest Shackleton. Shackleton in 1909 had reached within ninety miles of the South Pole, but was forced to turn back because of dwindling supplies. In 1912 the prize of the Pole fell to Amundsen and Scott, and in Shackleton's mind the one great challenge of the Antarctic remaining was a traverse of the entire continent. Shackleton planned to take his ship, the *Endurance,* to the southernmost edge of Weddell Sea, and from there to traverse the 1,800 miles across the Pole to McMurdo Sound in Ross Sea. It was a daring plan, and if he had been successful much of the region to the south of Weddell Sea would not now be a blank spot on the map. But the Weddell Sea did not look with favor upon this trespasser, and on January 19, just a few miles north of his goal of Vahsel Bay, his ship was frozen into the ice pack. Not as fortunate as Filchner who escaped from the ice pack unscathed, after ten months in the ice the *Endurance* surrendered to the unrelenting pressure of the ice and sank. It is a fine testimonial to Shackleton's ability as a leader that after the unimaginable hardships of dragging all the supplies and boats across the broken ice pack to open water, and then fighting the heavy Antarctic seas in flimsy open boats, all the twenty-eight men of his expedition were safely rescued and returned to England to fight in the First World War.

Shackleton was successful in connecting the land discovered by Bruce, Coats Land, with that discovered by Filchner, but all the area of Weddell Sea to the west of Vahsel Bay remained unexplored, for many years the last unexplored coast line in Antarctica.

It remained for Finn Ronne with his expedition of 1946-8 based on the Palmer Peninsula to fly over and map the Filchner Ice Shelf, and to discover the land lying to the south of the ice shelf, Edith Ronne Land.

But for forty years no ships ventured into the "hell hole" to jar the Weddell Sea out of its memories of broken ships and frustrated expeditions. Finally the spell of impenetrability was broken in 1955-56 when British and Argentine ice breakers fought their way into the heart of Weddell Sea and established three bases south of the 75th parallel. In January 1955 the Argentine ice breaker, *San Martin,* was the first ship to break west of Vahsel Bay, and penetrated 110 miles up the ice shelf into Gould Bay. J. McK. M.

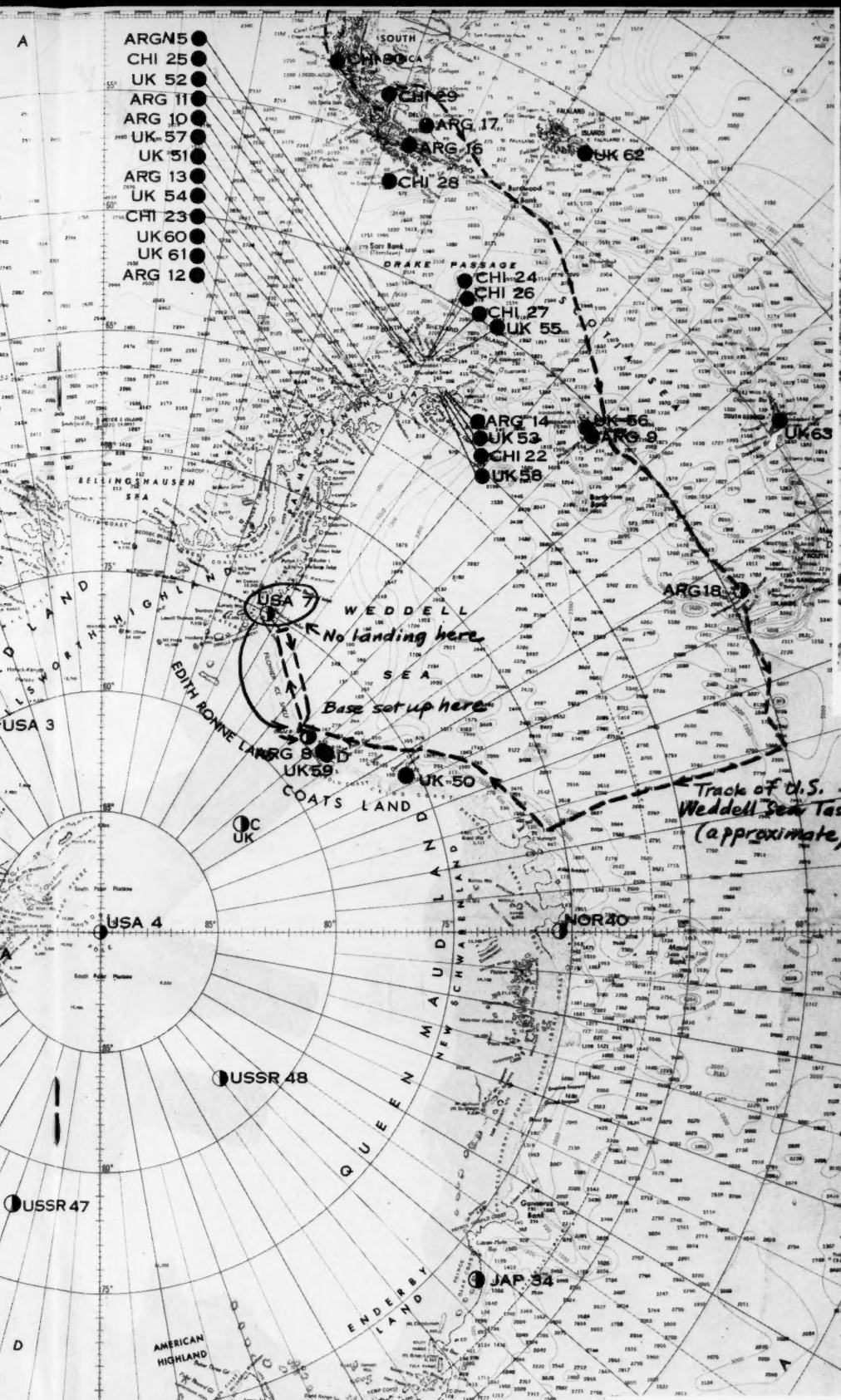
formed into the Weddell Sea Task Force under the command of Captain Edwin McDonald.

As a physicist studying the aurora australis, the southern lights, I joined my eight fellow scientists on the heavily-laden *Wyandot* in Davisville, Rhode Island. We left the United States on November 9, 1956, bound for the southernmost city in the world, Punta Arenas, Tierra del Fuego, via the Panama Canal and Valparaiso.

After spending three days in Punta Arenas rubbing the "good luck toe" on the statue of Magellan in the center of town, and reading and answering our last mail for 14 months, we sailed on De-

USS *Wyandot* follows the track cut through the Weddell Sea pack ice by the ice breaker USS *Staten Island.* For the author and many of his scientific colleagues, their first icebergs were a thrilling sight (page 14).

Picos del Payne Central, Ultima Esperanza, Chile, one of the last outposts of South America the Weddell Sea IGY expedition saw before crossing Drake Passage.



The ice breaker, USS *Staten Island*.

ANTARCTICA: part of U. S. Navy Hydrographic Office chart H.O. 16,429 showing Antarctic stations during the IGY 1957-58, with addition of approximate track of U. S. Weddell Sea Task Force. Chart specially prepared for "Operation Deepfreeze II" 1956-57.

cember 9 through the Straits of Magellan into the South Atlantic, heading for the Weddell Sea ice pack, and, we hoped, the Bowman Peninsula.

Because the ocean currents and the prevailing winds drive the ice westward, jamming it onto the Palmer Peninsula, the ice pack in the central and western portions of Weddell Sea is the heaviest in the Antarctic. To avoid this impenetrable ice pack we sailed on a southeast course planning to enter the ice somewhere near 60° south latitude and 10° west longitude. After passing through the pack and reaching the open water along the coast, we hoped to follow this water along Coats Land and along the Filchner Ice Shelf all the way to Bowman Peninsula.

During the week of sailing in the South Atlantic before entering the pack, we met English, Russian, and Norwegian whalers. Captain Finn Ronne, Norwegian by birth, spoke with several of the fleet of nine small Norwegian whale catchers, learning about ice conditions farther to the east. The only land we sighted was that of spectacular Bristol Island, of the South Sandwich Islands, a glistening glacier-capped white mountain rising straight out of the ocean.

After skirting the pack at 60° south latitude for several days, we entered the ice on December 17 heading due south. In the ice we passed numerous crab-eater seals, six-foot brown animals weighing four to five hundred pounds, and very often we met the glances of penguins acting as curious about us as we were about them. All that the penguins needed were binoculars and cameras hanging about their necks for us to forget we weren't looking in a mirror. Occasionally we would meet a single penguin, the lonely sentinel of an ice floe, and just one friendly "aark, aark" from a sailor would send him merrily rushing over to meet and investigate his long lost brothers.

The most numerous and friendly inhabitants of the ice pack are the comical Adélie penguins, 2–2.5 feet high, weighing 6 to 14 pounds. When called to the ship by an "aark," they immediately reply and then either run over with outstretched wings, or toboggan along the snow propelling themselves by swift kicks of their feet. Their heads are completely blue-black except for conspicuous white eyelids and large gleaming white coronas in the eyes. From the throat down their ventral surface is a dazzling metallic white, everywhere contrasting sharply with their blue-black dorsal surface and tail. The energetic birds dive head first into the sea from heights of 12 to 13 feet, and can leap from the water onto ice floes five feet above the water line, landing nonchalantly upright.

When we entered the pack we had hopes of effortlessly passing through the ice into the open water along the coast in five or six days. However, a week later found us 40 miles from the coast of Cape Norvegia, sending out messages such as: "Massive one- to five-mile floes, ten to twenty feet thick. Tips of all propeller blades sheared off by contact with the ice — operational ability unimpaired. Awaiting favorable conditions." We spent Christmas Eve in the ice, surrounded by penguins and pressure ridges, crowded around an old upright piano on a hatch cover under the midnight sun singing Christmas carols. Inside the ship everyone forgot the surrounding ice; the wardroom was cheered by a decorated month-old Chilean Christmas tree surrounded by colorfully wrapped

The author on the bridge of the *Wyandot*, with the *Staten Island* cutting ice ahead.

presents which we all opened before settling down to an immense turkey and ham Christmas dinner.

After 13 days in the pack we at last reached open water December 28, and sailed south with high hopes of reaching the Bowman Peninsula in a week's time. We stopped at the British Royal Society IGY base at Halley Bay, 75°S, 39°W, built on the edge of Coats Land ice barrier, appearing to us standing on the deck of the *Wyandot* only as a series of radio antennas extending above the surface of the snow. Just two miles south of Halley Bay we passed an emperor penguin rookery in a small indentation of the barrier, the 15 or 20 thousand penguins covering the ice in a dense black mass.

On Sunday morning, December 30, we woke up just outside the Dawson-Lambton glacier, a jumbled chaos of ice stretching across the horizon. It rose in a series of broken blue crevasses and huge blocks of ice up almost 600 feet into the low hanging clouds. The map is blank inland from this great glacier, and what must exist in that blank space to produce that outpouring of ice, we can only guess.

Sunday night we neared Vahsel Bay and the site of Shackleton's base, where the British Trans-Antarctic Expedition is hoping to fulfill his dream of a traverse across the continent. Both British bases in the Weddell Sea are being supplied this year by the chartered Danish ship *Magga Dan,* which was expected in two weeks. We learned that the eight men wintering over at Shackleton lost their stores and fuel last year when the bay ice used for off-loading broke up and drifted to sea. They were forced to spend the winter in tents with temperatures down to −64°, and had just moved into their hut, completed two months before our arrival.

Seventy miles beyond the British base we passed the Argentine General Belgrano base. Flights from this base established in January 1955 have discovered long glaciers and rugged mountain ranges between Weddell Sea and the Pole.

After four days of easy sailing in open water between the coast and the ice pack, we again entered the ice on New Year's Eve, and on January 1 we wired out our condition: "Northerly winds have tightened ice making it impenetrable even with ice breaker; waiting favorable developments." We awaited favorable developments for the next 11 days, unable to move forward or backward, watching pressure ridges build up in the ice

▲ "We were sailing past the Filchner Ice Shelf, the first men on the first ships to penetrate to and sail in these waters."

Six thousand tons of supplies, equipment, and building materials were unloaded from the *Wyandot* to build and maintain a base for scientific study on the thin ice edge of the Antarctic continent.

PHOTOGRAPHS BY
J. McKIM MALVILLE

near us and counting our diminishing supply of days left for building the base. During those 11 days we were virtually at the mercy of the ice pack; as long as the northern wind existed, tightening the pack, we could do nothing but wait and pester the weather men with questions. When the sun was shining over the limitless white ice, and when the blue tumbled pressure ridges cast long jagged shadows, all our fears and difficulties vanished, and we became completely entranced by the moods and beauties of the Antarctic.

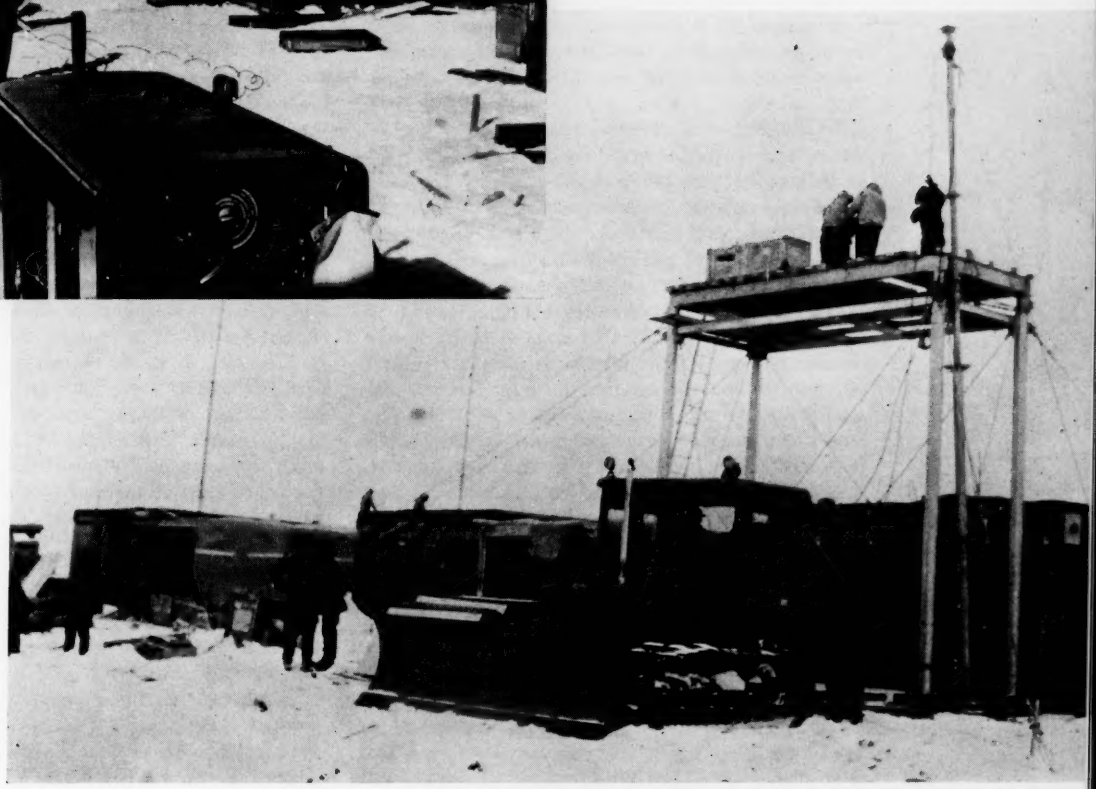
On January 11 the mysterious and inscrutable forces of the ice pack opened up a lead toward the west and we immediately followed the *Staten Island* as she broke a path to open water. But we soon were confronted by the cause of all our trouble of the past week and a half. Two immense 30-mile-long ice bergs, fragments of the ice shelf near Gould Bay, had caused the westward flowing current to jam the ice against the two grounded bergs. We finally negotiated the ice and reached open water, but only at the expense of ripping a large hole in the skin of the ship through which water rushed into one of the forward holds at 200 gallons a minute.

The open water to the west of the two bergs was in the words of our situation report, "the most beautiful open water highway in the world." Group morale was up 100 per cent; we had at last reached the open water leading all the way to the Bowman Peninsula. We were sailing past the Filchner Ice Shelf, the first men on the first ships to penetrate to and sail in these waters. With luck we would be constructing our base in a day or two.

But the Weddell Sea had different plans for us; on January 15, just 42 miles short of the Bowman Peninsula, we were stopped by ice again. While the two ships waited in the open water the ice and the Bowman Peninsula were investigated by a helicopter flight. No suitable base site could be found on the Peninsula to justify risking the ships by advancing further into the ice pack, and the de-

Prefabrication made assembly of the base buildings an easy job for the Seabees. The underfloor girders rest on 8-foot lengths of planking.

The hut walls are plywood and fiberglass over aluminum girders. Everything was hauled two miles inland from the ship by tractor sledges (see front cover).



The "aurora tower" for the author's study of the Aurora Australis was built 25 feet over the science building to rise above winter snows for year-long observation of the beautiful and strange phenomenon.

cision was made to turn around and look for a base site near Gould Bay. The point of our deepest penetration up the Filchner Ice Shelf was 75°25′ S, 59°58′ W.

We retraced our steps along the ice shelf and again in a day's time reached the ice jam around the two ice bergs. We struggled through this area for another ten days and broke out in the early morning hours of January 27. It is hard to describe the beauty of ordinary deep blue water after spending days and days surrounded by nothing but the frustrating mute ice pack. We sailed for several hours in this wonderful water searching for a suitable base site, and in the early afternoon located what looked like an excellent unloading platform for the ship and two miles inland a good location for the base.

During the following two weeks all the 6,000 tons of station equipment was unloaded from the *Wyandot,* and the Seabee construction battalion assembled the prefabricated huts. As I am writing now, February 10, the ships are due to leave at 1200 hours February 11, and the 38 of us will be left to the Antarctic wind and snow. For the past 36 hours while a blizzard has slowly been picking up momentum, everyone has been working around the clock in a last minute effort to finish the major construction projects.

(To be continued in a future issue)

'Specialized' Travel in Mexico

CHARLES & PATRICIA VAURIE

SEVERAL HUNDRED THOUSAND people drop in every year to visit our friendly neighbor to the south. The large majority come in their own cars and have a lot of fun seeing the many picturesque towns and villages. Roads and accommodations are usually good or adequate, prices reasonable, and most people leave saying they hope to come back some day, some adding "but off the beaten track next time."

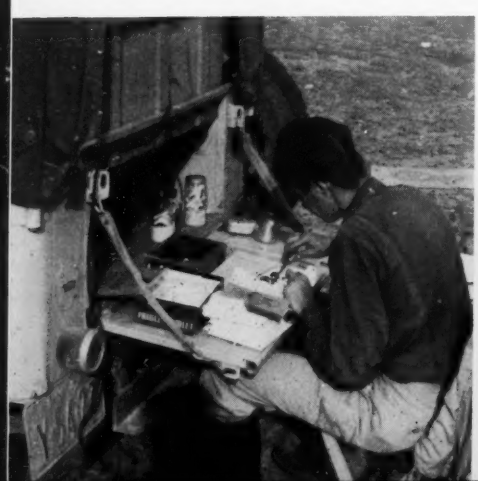
Through chance and necessity all of our travels have been of the last variety. They have in fact been highly specialized, for we happen to belong to the rather comical class of specialized travelers called "bug collectors." For us it is not any old bug, but mainly beetles, and often one special kind of beetle. We have pursued them in most of the states of Mexico, in the northern deserts, on the arid coast of the Gulf of California and on its barren islands, on the humid coast farther south, in the cool highlands of the central plateau, on both sides of the Isthmus of Tehuantepec, and in the mountains of Veracruz and Chiapas. We have had to work when the temperature rose to 145°F., as on the island of Tiburon, or under steady drizzles on some of the high prairies of the central states, or in bone penetrating mists in Chiapas, and steady downpours in southern Veracruz. Naturally, motels or even roads were not always available. We were mostly very much "off the beaten track."

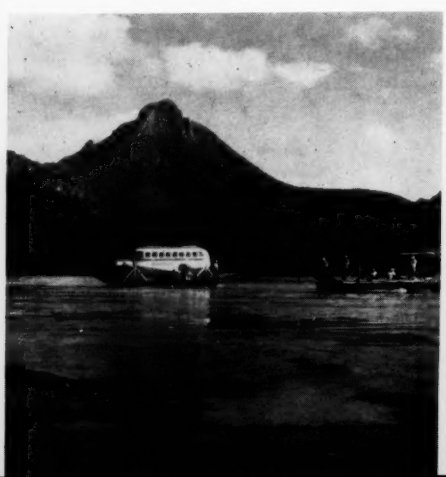
One should be prepared to meet almost anything, to carry almost everything, and to be asked all sorts of questions. The bare fact that one is collecting insects is not, either in Mexico or elsewhere, any explanation at all; people are sure there must be some logical reason for such illogical and ridiculous pastime. The truth — that the insects are wanted for study — is the weakest possible answer you can give. You sometimes can get away with answering "agricultura," but if you have a smart questioner this might lead to more specific, even awkward questions. The best silencer to "What are they for?" is "medicina." At this reply people usually nod their heads sagely in approval and look on you with less astonishment and more respect. An old Indian woman once amazed us, however, by asking, with some condescension, "But don't you have any bugs in your country?"

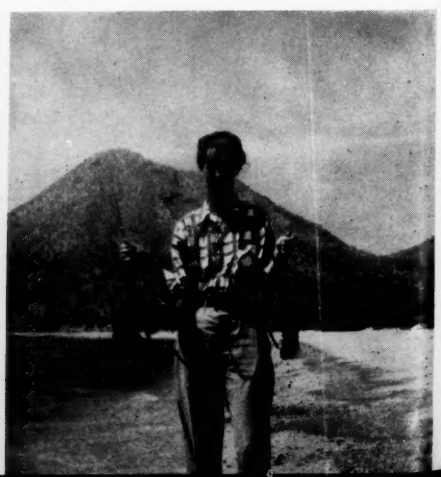
A modern passenger car is certain to be virtually useless off the paved roads, especially during the rainy season. We have used a Jeep, with or without a trailer, and a "carry all," and a Jeep station wagon. The latter was equipped with a built-in hinged wooden platform on which we slept very comfortably on top of air mattresses. Underneath was our collecting gear and supplies. Our working material includes an icebox. We learned to include this item the hard way, after having spent an agonizingly thirsty summer on the dry coast of Sonora. It is wonderful but true that a supply of ice never failed us anywhere in Mexico.

Food was never a problem. Canned food can be bought in Mexico in good variety but the prices are higher than in the States, and the most satisfactory way is to estimate needs in advance and to carry in such items as canned meat and certain fruits. Bread vegetables, eggs, and all fruits that can be peeled we buy locally. We also buy our drinking water, a five-gallon bottle of which costs but one peso. Beer or soft drinks are available everywhere and there are also some excellent mineral waters. In towns and villages it is wise to shun food served and cooked in the streets, and in restaurants to avoid food that is not cooked, such as salads, no matter how tempting, or food that is too highly seasoned. Mexicans love the latter and are used to it, but Americans may get upset and upsets can spoil a trip. The "turistas," as a certain upset is euphemistically called, is not fun, and by good luck or good management we have avoided it. Culinary surprises may be in store, even in the wild, as on lonely Tiburon where on the southern end of the island, all the lobsters one can eat can be caught in a few minutes. Boiled in sea water and served with mayonnaise (which we carry as a substitute for butter because it does not spoil even in great heat), they are almost worth the trip. On the coast excellent fish of much variety can be bought from the fishermen, also sea turtle.

Camping spots present a problem, but only if one sticks to the paved highways. One can go many miles without being able to leave the highway because it lacks adequate shoulders or any way to go off, and camping by the side is neither pleasant nor safe. Many big trucks pound by all night and on the highways one is more certain to be disturbed by visitors who seemingly appear from nowhere. The most beautiful campsite we have ever found is in northeastern Mex-







ico, south of El Mante in the state of Tamaulipas at a place called El Salto, just 18 miles from the junction of the San Luis Potosí highway that turns west at the town of Antiguo Morelos. El Salto is a spectacular waterfall, its water, after the first big jump, flowing into a series of pools where swimming is ideal. Other campsites which remain in our memory are odd little spots in the desert, with many stars but no mosquitoes, the wonderful beaches of Kino Bay in Sonora or near Manzanillo, Colima, with their unbelievable sunsets, the rim of the Canyon of Sumidero in Chiapas, and the incredible motel at Lake Catemaco in Veracruz.

There was no reason to camp at the lake except that everything was so perfect – setting, accommodations, and price. Luxurious bungalows for two cost only 35 pesos a day, or about three dollars. In other parts of Mexico, the price may be as low as 18 pesos a day, but one place is said to charge as much as 250. There is no guarantee, however, that a higher price necessarily means better accommodations or vice versa. Motels are beginning to get quite numerous in Mexico along the main highways and the network of the latter is increasing rapidly every year. On our first trip to Mexico there was only one paved highway, from Laredo to Mexico City, continuing on to Puebla and half way to Guadalajara. There are now too many to mention. Some of these, such as the one on the west coast, are excellent, but all in all, they leave much to be desired. Some are in a continuous state of disrepair with so many and such deep chuck holes that they are hazardous. Some are very rough, although paved, and narrow, sometimes with the sides of the road eaten away in spots. Other hazards include the human and animal propensity to walk, sit or lie stretched out on the highway, the cattle and donkeys often refusing to budge. One also has to watch for rocks left by parked trucks, because, in spite of hortatory signs to the contrary, people normally fail to pick up their props when they drive off. It is decidedly not advisable to try for long distances at night.

Around central Mexico where there are many roads, directions are usually shown by readable signs, but not necessarily so. It is well not to take any maps for granted and when one has to ask directions, it's a wise person who asks again and again. We have taken a number of "paved" roads that never did get paved and have also been pleasantly surprised at finding paved roads not so indicated on our map. Often the road is well marked with various warning signs, but in other places there are no signs at all. Thus near Nautla on the coast of Veracruz the highway ascends steeply to a bridge which is no longer there. Presumably local people know of its demise, but how about a stranger?

Other things: Do not drive over wide, flat, and inviting stretches, particularly near the coast, unless someone has been there before you. You may break through and even four-wheel tranction may not get you out. Hard packed beaches can be driven over, but local tides and winds are tricky. It is always safer to stick to wheel tracks made by others even though some are deep and one may scrape bottom. These tracks also have the disconcerting habit of parting company in the midst of nowhere; and with three or four sets going off in different directions to choose from, you are offered a sporting chance.

The bright spot in all this talk of the inadequacies and annoyances of Mexican roads is the never failing helpfulness of the Mexicans in case of trouble. An adventure of ours well illustrates this and also that one may expect anything from the weather. It was July in Sonora and the rains had not yet begun. One afternoon we went to the canyon of Gavilan near Hermosillo to see what it promised in the way of our insects. "Only a mere half hour drive," they said, so we hoped to go and return before dark. We had a Jeep but left its canvas doors in town. The dirt road was tricky and it took us much longer than we had been told. The canyon is a beautiful spot with a lazy little stream and under normal conditions would make a wonderful collecting and camping place, but conditions soon became abnormal. A big cloud hovered over our heads. A few drops of rain began to fall and we remembered a warning that the spot has an evil reputation during the rainy season. We left but not soon enough. The first storm of the season broke upon our open Jeep and raged for nearly eight hours afterward. We had been able to get out of the canyon and reach high ground but we were cut off by a flooding arroyo and held up for the night. Only a person who has experienced the "break" in the season when caught in open country can appreciate what these storms are like. A shivery dawn finally came but everything, including ourselves, was a shambles, and our motor was dead. A truck soon came along and everyone in the back of it jumped out to push us but to no avail. Another truck pulled up showing signs of the storm, but the driver was wise to a wet motor. He finally got us started and the three cars formed a convoy for the muddy pull ahead. The men – they had given us their last cigarettes and a precious remaining two inches of mescal, insisting that we needed it more than they – made us go first, afraid that their double wheels would tear up the way too much for us to follow. We eventually crawled up to a wide and swiftly flowing river that had not been there the day before, and with mules dragging us through, we finally made the other side. It had taken about an hour and a half to reach the canyon. It took 14 to get out. At that we were lucky.

Hours pass easily in Mexico, however, and the wonderfully varied country has so much to offer that it is difficult even for the ordinary tourist not to quickly become some sort of specialist. One does not have to adopt bug collecting as a specialty or pursue it quite so far afield. But we think it is a lot of fun.

(LEFT) **A Jeep tailgate is everything from kitchen table to office desk.**
(CENTER) **Ferries like this one at Los Mochis have saved a lot of bridge building.**
(RIGHT) **"Anyone for lobster Newburg?"—Tiburon Island, Gulf of California.**

ERNEST P. EDWARDS

Discovery on a Mexican Hillside

ENTERING a small barranca which opened into the big Cañon de Lobos, we began climbing toward the northwest up the rough trail which threaded along the steep slopes. Intermittently the song of a golden vireo came from the scrubby trees ahead. We saw the nest of a streaked-backed oriole hanging from the tip of a slender branch, swaying in the wind; and then as we moved a few yards beyond it the brilliant adult oriole flashed in to add some fibers to the still incomplete nest.

We were on the Pacific slope of Mexico, a few miles southeast of Cuernavaca in the state of Morelos. Richard Woodard and I, entering an area which had seemed to him to be one of the most interesting in the vicinity of Cuernavaca, had expected to find there the colorful birds of western Mexico, and indeed we began hearing the familiar calls and seeing the birds even before we walked away from the highway. A faraway group of chachalacas made the hillsides ring with their combined efforts, in marked contrast to the almost apologetic hooting notes of the russet-crowned motmot, calling from the roadside. The lively activity and the cool, clear air of the early morning seemed to give promise of even more than the usual interest and excitement of the Mexican countryside.

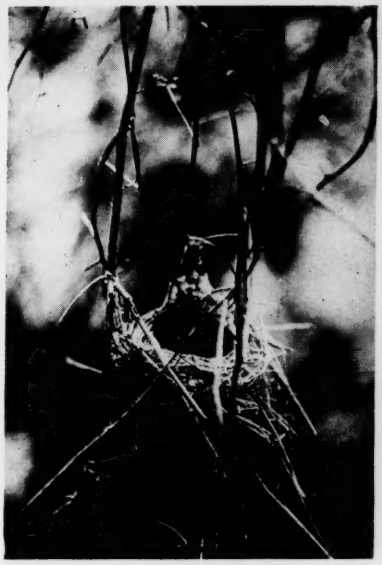
At its upper end the barranca merged with an open, gently sloping valley — a natural amphitheater falling away from a low half-circle of hills. Near the trail the Western wood pewee was active. Several were hawking insects from the bare treetops, or carrying nesting material to one of the two or three partially completed nests which we soon discovered.

Amid the activity of the pewees, of the black-chested sparrows in the undergrowth, and of the happy wrens and banded wrens all about us, we almost failed to notice a small, drab flycatcher which pursued insects in a leisurely manner close to the ground. It might have passed for a pewee had it been in the treetops, but now we noted that it was not so dark and sleek. It had prominent white wing-bars and white around the eye, but seemed too long-tailed for an Empidonax, such as the least flycatcher, the Western, the gray, or the Hammond. We thought of small drab flycatchers we might expect to find in Mexico, hoping it might be one of the rarest ones, and meanwhile trying to observe it closely through our binoculars. At short intervals it flew out for insects, always remaining low, several times even alighting on a large stone, virtually on the ground. In a momentary pause the bird turned and raised what seemed to be a ragged crest, but intervening twigs prevented our getting a clear view. It brought to mind the pileated flycatcher, which had first become known to science less than 20 years ago. Called *Aechmolophus mexicanus*, it was so different from previously known flycatchers that a new genus had been created to receive it. It had been seen only rarely since, each time apparently on the rather barren Pacific slopes. One of the distinctive features of this rare species is its *long, pointed crest.*

We tried to study it more closely, but it moved rather quickly away from us, in short flights, and soon disappeared completely in the undergrowth. We turned our careful attention, then, to our surroundings. If this should be the pileated flycatcher we would want to know its habitat in detail. The ground was very rocky, with little grass or herbaceous vegetation. It seemed dry and unproductive. There was a considerable amount of prickly pear cactus, a scattering of small palms similar to our cabbage palm, and a moderately dense growth of rough, thorny trees of many different species. The tree cover varied in height from about 15 to 25 feet, and in late April only a few of the trees had leaves. Signs of cattle and goats were evident around us. They must range over almost every square foot of this scrubby valley and hillside in their search for food.

We moved slowly up toward the rim of the amphitheater, studying each small flycatcher we saw, whether in treetop or low shrub, searching for one which showed a ragged crest. Within a few minutes a strange flycatcher came into view again, moving as before close to the ground and coming down once in a while to pick up an insect. Then suddenly, almost unbelievably, the bird raised its crest in full silhouette. Several long, slender, pointed feathers stood out clearly from the head, arching upward and backward. There was now no doubt of the bird's identity — it was a pileated flycatcher, only a few miles from the area where the type specimen was taken. This time, as we watched, it called, in notes completely new to us, *two* different phrases instead of just one, the first loud and clear, the second longer and rolling. We were probably the first to hear and recognize this call. The bird's tail dipped slightly with the loud whistle of the first phrase, vibrated rapidly with the rolling notes of the second phrase. After a few repetitions of the call we felt we could recognize it almost anywhere, and several times after we lost the bird again and moved back down the hillside we heard the *twheeyu - dr-r-r-r-r-eetyu* from the scrubby woodland.

It would have been exciting enough to have found a single wandering bird, but the circumstances of this discovery strongly indicated we had actually come upon a small colony. It was not too much to hope that through careful observation on subsequent visits we might discover the nest and eggs, which were apparently unknown. Consequently when I returned to the Cañon de Lobos on May 24 I determined to bend every effort toward finding the flycatcher's nest. The fact that more than one bird was calling as we moved up toward the amphitheater was very encouraging. The group of people with me learned the call almost im-



Pileated flycatcher (author's drawing), and nests. (Photographs [LEFT] by John Sherrin; [RIGHT] by the author)

mediately, and we had scarcely emerged from the upper end of the barranca when the flycatcher came into view. Our close approach did not seen to frighten it unduly, and there was no mistaking its identity when each of us could study it from a distance of only a few yards. Its behavior suggested, as we had hoped, a nest nearby. It moved about on short flights as before, but seemed to return persistently to the vicinity of one of the larger trees in the area. Believing a direct search might be as fruitful as anything, I moved quickly into the center of the bird's territory – if the nest remained undiscovered we could still move away to semi-concealment and watch for the bird to return to the nest and reveal its location. I found myself in a rather open space under a tree which resembled an old, sprawling apple. The pileated flycatcher stayed close by, making a very soft clucking noise, and jerking its tail up nervously. I had difficulty in visualizing what sort of nest to expect. Most of the species' close relatives in Mexico construct a cup-shaped nest in a crotch, while a few others build a completely enclosed, sometimes pendant, nest – an ovoid mass of material with the entrance at the side or bottom. I felt sure that the nest would be near the ground because of the bird's habit of feeding in the low shrubbery, and I half expected to find a cup-shaped nest saddled on a branch. But no large knot nor foreign mass interrupted the symmetry of the branches. The search seemed fruitless, until I moved to step around a small branch and caught sight of a nest hung between two vertical twigs a foot below the main branch. It was *not* a thick-walled nest resting on top of a forking branch or in a vertical crotch. It was a deep cup *suspended* at two points on the rim, and the walls of delicate twigs, small grass stems and other plant fibers were so thin as to admit light from the sides and bottom. Within was a single young bird, apparently hatched only a few days before. I had no doubt this unusual nest was indeed that of the pileated flycatcher, but to fully establish the fact I moved well away from it and watched quietly. Within a few moments a small flycatcher flew to the tree and moved toward the nest. A quick scrutiny with the binoculars revealed the pileated flycatcher. It then flew directly to the nest, and perched for almost a full minute on the rim; then dropped in and covered the young bird. The adult bird's crest rose again and our search for the nest of the pileated flycatcher was successful.

We were to learn later that there were other nests of this rare species in the area. Each was pendant, as the first, suspended at two or three points from vines or hanging twigs. One contained three eggs, pale brownish-buff in color with a few spots of reddish-brown near the large end. Another had a single young bird and no eggs. At these nests we were able to document with photographs and motion pictures some of the important things we had discovered – the color and size of the eggs, the appearance of the nestling, the size and structure of the nest, even the behavior of the adults as they came in to feed or brood the nestling. Still later when it was empty we collected the first nest discovered, as a permanent record.

As we left the area in late June the now-familiar two-phrased call sounded from three or four widely separated points around us. The colony seemed well established, perhaps able to hold its own through the normal crises of nature, perhaps even to increase in numbers and spread farther across the scrubby hillsides of the Cañon de Lobos.

CLIMATE ON ICE

PHILIP HYDE

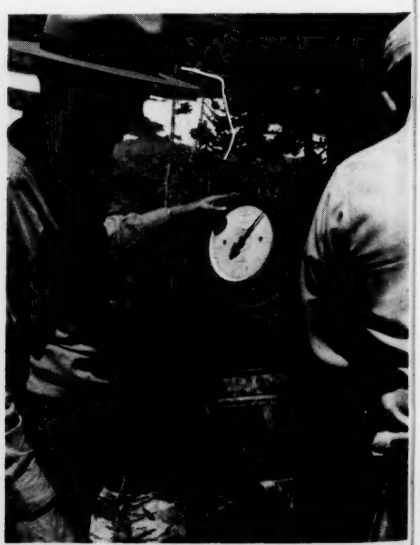
HIGH ON A ROCKY SHELF near the tongue of a great body of glacial ice in Montana, the U. S. Weather Bureau is making its first attempt to correlate data on precipitation with measurements of run-off and glacier movement. When they have been at this important work long enough, they hope to be able to tell you and me a great deal more about our climate.

But don't hold your breath waiting for the data that will come from this work. Scientists expect to take at least another 20 years, before they have enough data to draw conclusions from, and it may take 100 years before the data are complete enough. The important thing to us today is that they have made a start. In August of 1949, Weather Bureau men, in coöperation with the National Park Service, packed up supplies and equipment and began the nine-mile trail ride from the Many Glaciers stables, on the east side of Glacier National Park, to Grinnell Glacier. There, high on the steep-stepped shelves of metamorphosed sandstones and clays, on the edge of the glacier, they set up a 21-foot black pipe, known to the Weather Bureau as a Standpipe Storage Gauge. It had to be sturdy enough to withstand the winter's high winds and shifting snow, and tall enough to lift its head above the deepest snowpacks.

Since 1949, each summer, the Weather Bureau has been sending a team up to the gauge to draw off the collected precipitation and recharge the gauge for another season's operation. This past summer, the writer and his wife accompanied the team of Weather Bureau and Park Service men. Our party included the Montana State Climatologist, R. A. Dightman; Wallace Irgens, in charge of Weather Bureau Substations in Montana; Clarence Jordan, the Supervisor of Substation Inspection, in Washington, D.C.; Harry Robinson, Chief Park Naturalist; and Don Robinson, Park Service Naturalist.

Our ride over the trail from Many Glaciers took us through the glacial cycle, in reverse, beginning on the forested floor of the great U-shaped valley carved by the ancestor of the present Grinnell Glacier; past glacial flour-filled lakes of melt-water, occupying depressions in the valley floor; finally, up to the naked rock shelves recently vacated by the glacier as it receded to its present size. We dismounted in a clump of alpine firs, the outpost sentinels of the world of trees and plants in this high, barren country where only the beginning of life-sustaining soils exists. In the center of a small clearing was the tall black pipe of the precipitation gauge. We watched as the men first went through the process of draining out, through a valve and outlet at the base, the accumulated moisture that had entered the top of the pipe as rain or snow. The solution inside was drawn out in buckets, each one carefully weighed and recorded. When the necessary calculations were completed, we learned that the gauge had collected 100.11 inches of precipitation since the previous August.

The recording done, the process of recharging the gauge for its next season's chore began. This consisted of adding a solution of calcium chloride, topped with a film of oil, to prevent evaporation. The calcium chloride prevents the solution from freezing in the sometimes sub-zero winter cold of this place, and also turns any frozen precipitation into water. When the recharging operation at this gauge was completed, the



▲ On the trail to Grinnell Glacier.
➔ Draining the solution from the gauge and weighing it.

party packed up and rode over to the other side of the glacier to a point about a half-mile from the first gauge, where a second gauge was installed last year to augment the data from the first. While the measuring and recharging process went on at gauge number two, my wife and I decided to have a closer look at the glacier.

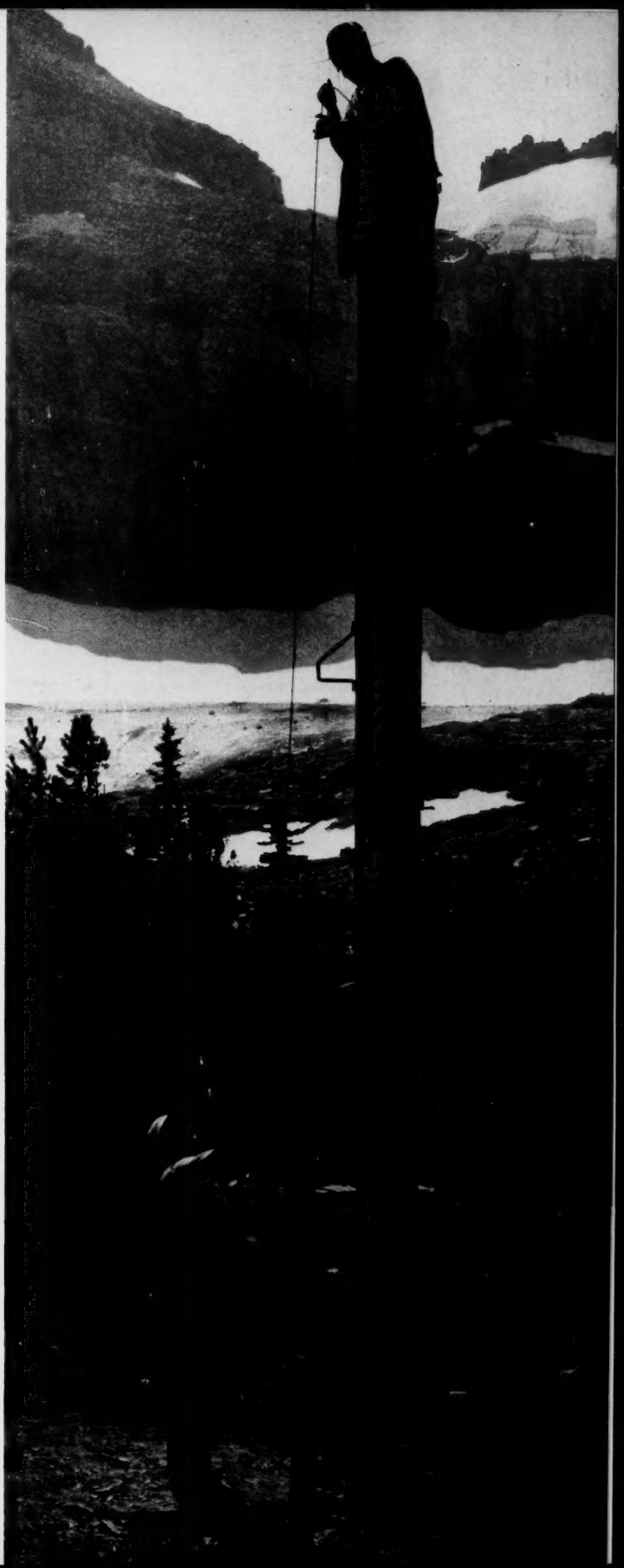
It was interesting to examine the glacier in the light of what Mr. Dightman said of them as cumulative results of climate. A great deal might be learned about our climate, if we knew how to read the record that is embodied in the glaciers. Out of this realization grew the plan to install the precipitation gauges as close as was feasible to Grinnell Glacier. Thus far, this is the first attempt to accumulate data on precipitation on a glacier. The data thus accumulated can be correlated with that gathered on the runoff from the glacier basin at the U. S. Geological Survey's gauging station on Grinnell Creek, at the foot of the great cliff just below the glacier. Further data are gathered annually by the National Park Service teams that measure and survey the glacier for movement and size.

The climatologists say that this collection of data will add much to the knowledge of the relationships between climate and glaciers. Although these gauges have been in operation for only seven years, there is already some indication that the data from them have some significance. It ties in with other evidence, mounting in recent years, of a trend toward cooler and wetter climate, particularly in the Northwest. The Coleman Glacier, on Mt. Baker, in Washington's northern Cascades, has shown considerable recent growth. The records of the Tatoosh Island Weather Station in Puget Sound show a definite trend toward cooler and wetter weather. Here, at Glacier National Park, M. E. Beatty, formerly Chief Naturalist, reported in 1955 that Grinnell Glacier had stopped wasting.

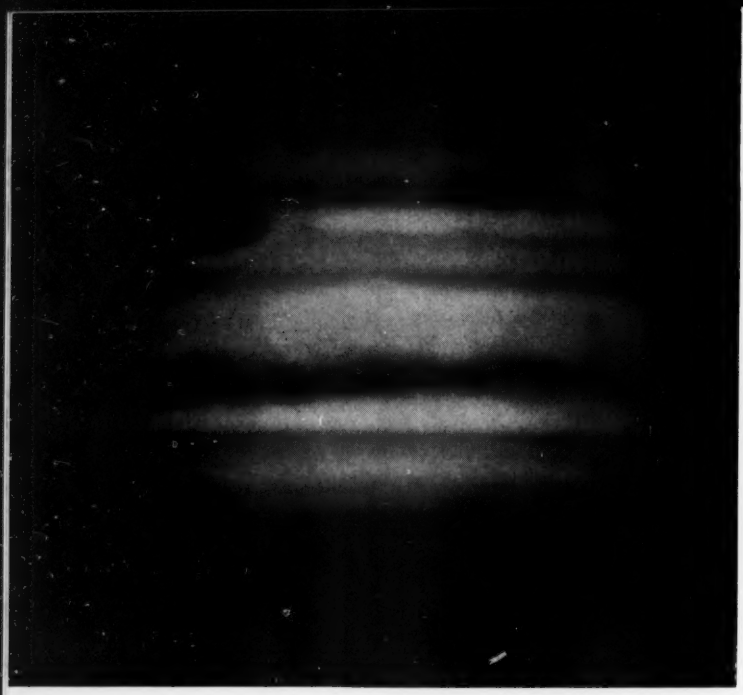
In the abstract, it may not mean much to you and me that our climate may be getting colder and wetter, for the weather records refer primarily to changes that may be almost imperceptible in our daily lives. But translated into such things as long-range forecasts of the water supplies of a given region, the information that this greater knowledge of climate furnishes may someday mean the difference in whether or not our cities will have enough water to fulfill our increasing individual and industrial needs. Seen in this light, the studies on Grinnell Glacier have an immense import to all of us.

Mr. Dightman, in his Progress Report on the Grinnell Glacier Studies, says of this project, that it "holds real hope for improving our ability to use glaciers as climatic indexes, and for increasing our understanding of climatic changes, of which glacier growth and ablation are only one result."

It is often said that everybody complains about the weather, but nobody ever does anything about it. Perhaps studies of this kind, by increasing our understanding of the natural processes of climate, can eventually help us to do the only thing we can do "about" it, namely, learn to govern ourselves and our affairs so that we can live in harmony with the weather.



Clarence Jordan and Don Robinson (aloft) recharging the gauge. (Photos by author)



JUPITER • KING OF • PLANETS

VENUS AND JUPITER will be close to each other this summer for a few days around August 22, in the western sky at sunset. They will be separated, in conjunction, by only 0.5 degree. Jupiter, the fainter of the two, will be many millions of miles farther away from earth than Venus. Nearest of the planets to the earth, Venus is often called the earth's twin – it is about the same size – but we know very little about its surface conditions. A thick layer of enveloping clouds hides her secrets from the prying eye of the astronomer. (See "A Case for Frog Men on Venus"; *PD*, Jan.-Feb., 1956). Jupiter, like Venus, is surrounded by clouds, but the structure of Jupiter's clouds gives the astronomer clues about the planet's interior.

Jupiter is the largest of the nine major planets revolving around the sun. It would take 318 planets the size of earth to "weigh" as much as Jupiter, whose volume is greater than all of the other planets combined. Jupiter reigns supreme in its territory of space, 483,900,000 miles from the sun. It journeys around the sun in its orbit at 8.1 miles per second, completing its trip in 11.86 years.

This giant world, Jupiter, was once thought to be a wandering star. Early people believed that all the planets were stars. The word planet comes from a Greek word meaning wanderer. The astronomer Copernicus in the early 16th century suggested that the planets were worlds, similar to the earth, moving in circular orbits around the sun. Galileo found that Jupiter was not a star when he looked at it through his telescope in 1610. He saw that the planet was disk-shaped while the stars in the background still looked like points of light.

Galileo noticed four star-like objects near Jupiter. As he watched night after night, these "stars" would move from one side of Jupiter to the other. Galileo was quick to realize these objects were not stars at all but moons revolving about Jupiter. Their orbits were turned practically edgewise toward the earth, so the satellites had the appearance of moving from one side to the other. Until Galileo's discovery of the four satellites of Jupiter, many of his contemporaries believed seven was the perfect number of the universe. Seven objects moved in the sky: the sun, moon, Mercury, Venus, Mars, Jupiter, and Saturn. Galileo with one stroke destroyed the foundation of these numerological beliefs, for by looking through his *optic tube* one could see four additional objects that moved. These four satellites of Jupiter are quite bright and are easily seen in a small telescope. They are generally designated by the roman numerals: I, II, III, and IV. Their proper names are Io, Europa, Gannymede, and Callisto. Since Galileo's time, astronomers have discovered eight additional moons belonging to Jupiter. Most of these are very faint and it takes a large telescope to detect them.

Thus Jupiter has more moons than any other planet. What a romantic world Jupiter must be with twelve moons in its sky! Perhaps a nice place for a honeymoon? – If you can hardly wait to rush over to the nearest space terminal to buy tickets for two to Jupiter, I would suggest you stop a moment and consider what you would have to pack in your suitcases for the journey: gas mask, snow shoes, hot water bottles , – or if you are wealthy, an electrically heated space suit. Why all this? The measured temperature of Jupiter is 200° below zero on the Fahrenheit scale. It is 5.2 times as far from the sun as the earth. Poisonous gases have been detected in its atmosphere. If these facts are not enough to discourage you from taking a trip to Jupiter consider this: on Jupiter you would weigh 2.5 times as much as you do on earth. The planet is so massive that its surface gravity pulls more strongly than earth's. If you plan to carry your bride across the threshold on Jupiter, she will weigh 2.5 times her normal weight. If she weighs 120 pounds on earth, on Jupiter she would weigh 300 pounds!

The King of Planets is robed in brownish, yellowish, and reddish clouds. These clouds stretch out in "belts" more or less parallel to the equator. The astronomer has never seen Jupiter's surface, for the atmosphere is very deep. Just where the solid surface of the planet lies is by no means certain. Probably there is a gradual transition from the thick envelope of clouds surrounding the planet to a region where the gases become highly compressed; this may then merge into a semi-solid surface of frozen gases.

Dr. Rupert Wildt of Yale University estimates that the center of the planet is a metallic rocky core 38,000 miles in diameter. Over this, he suggests, is an icy layer some 17,400 miles thick, which is finally topped by an atmosphere of compressed hydrogen, helium, methane, and ammonia about 8,000 miles deep.

Jupiter shines by reflected sunlight. The sun is the public utility of the solar system, furnishing light and heat for all the planets. If we allow the reflected light from Jupiter's atmosphere to pass through a spectroscope it is spread out into the colors of the spectrum. Crossing this spectrum are many dark lines. The posi-

Jupiter through the 200-inch Hale telescope, 23 September 1951. Cramer Contract plate; 1.5 seconds exposure. (Courtesy of the Mount Wilson and Palomar Observatories)

tions of these lines indicate the presence of certain gases in Jupiter's atmosphere. Using these spectral "fingerprints," the astronomer has detected the presence of such poisonous gases as ammonia (NH_3) and methane (CH_4). Indirect evidence suggests that hydrogen and helium constitute the bulk of the atmosphere. Ammonia and methane are compounds resulting from the union of hydrogen with nitrogen and carbon respectively. At the frigid temperature of Jupiter —200° F., most of the ammonia is frozen while the methane remains in the gaseous state.

When one observes Jupiter through a telescope for the first time he immediately notes the planet's decidedly squashed appearance. The equatorial region is bulged outward because of centrifugal force from the rapid spinning of the planet. The diameter from pole to pole is 82,800 miles while the equatorial diameter is 6,200 miles greater. Jupiter has the shortest period of rotation of any planet. A Jovian day lasts less than ten hours.

Watching Jupiter through a telescope for a few hours, one may see the cloud formations on the planet moving by. The whole of Jupiter does not turn in the same period. The equatorial regions turn once around in $9^h\ 50^m$ while the clouds nearer the poles drag around in $9^h\ 56^m$. If one were standing on the equator of Jupiter he would be hurtling along at some 28,000 miles per hour. This rapid spinning would exert a powerful centrifugal force about one eleventh as strong as the gravitational force of the planet. This would have the effect of reducing the weight of anything on the equator. Thus, our young bride referred to a few paragraphs back would have her weight reduced by over 27 pounds. (The centrifugal force at the earth's equator would reduce her weight by only two-fifths of a pound.)

When we spy on Jupiter through our telescopes, we do not expect to find permanent markings there because we are looking upon shifting and churning clouds. Nevertheless, several semi-permanent markings have been traced for many years in the Jovian atmosphere. One such feature is the South Tropical Disturbance, first observed in 1901 as a small dark spot in the planet's southern hemisphere. This disturbance gradually developed into a long drawn out dusky region and could still be traced in 1939.

One of the most famous features on the Jovian face is the Great Red Spot. This is a huge oval spot some 30,000 by 7,000 miles. It has been traced on drawings of Jupiter made as early as 1831. At times it has been very conspicuous while at other times faded almost into obscurity. The exact nature of the Great Red Spot is not known. A suggestion has been made that it marks the presence of a volcano beneath the clouds. It is quite plausible that deep in Jupiter's interior the temperature is high. One contributing factor to this would be the powerful pressures exerted by the overlying ice layers and compressed gases. Another factor might be heat generated by radioactivity. In any event, high temperatures might well be produced that could lead to some type of vulcanism. Let us use our imaginations to picture a Jovian volcano at work: molten lava melting its way through heavy layers of ice then oozing through the slushy surface of the planet and bursting into the icy atmosphere dispersing its metallic vapors high into the Jovian sky. It has been proposed that the colors of Jupiter's clouds are due to these metallic vapors reacting with ammonia. Another explanation of the Red Spot is that it is an island of solid ammonia and methane floating in the dense atmosphere. Observation seems to indicate the spot lies somewhat below many of the cloud layers of the planet.

Whatever the proper explanation may be, we do know something is going on in the Red Spot region. Since 1955, with newly perfected radio telescopes, astronomers have been listening to radio static from that area of Jupiter. Systematic observation with radio telescopes were begun in 1955 by the Carnegie Institution of Washington. Tuning in on Jupiter with their radio telescopes at a frequency of 22 megacycles, listeners got loud static at regular intervals found to correspond to the period of rotation of Jupiter. Con-

SKY DIARY

(Pacific Daylight Saving Time used throughout)

Phases of the Moon

First Quarter	July 4	5:09 A.M..
Full Moon	11	3:50 P.M.
Last Quarter	19	7:17 P.M.
New Moon	26	9:28 P.M.
First Quarter	August 2	11:55 A.M.
Full Moon	10	6:08 A.M.
Last Quarter	18	9:16 A.M.
New Moon	25	4:32 A.M.
First Quarter	31	9:34 P.M.

Meteor Showers

July 29-30—**The Delta Aquarids:** maximum about 20 per hour on that night, with duration of 15 days around it. Meteors radiate from area near the star Delta Aquarius. Best time for observation: after midnight.

August 11-12—**The Perseids:** maximum 50 per hour that night, with average count diminished somewhat this year by bright Full Moon. Observable a week before and after this date. Best: after midnight.

The Planets

Mercury: superior conjunction with the sun, July 4. Visible in west after sunset during week around Aug. 13; sets about an hour after sunset on that date; magnitude + 0.06.

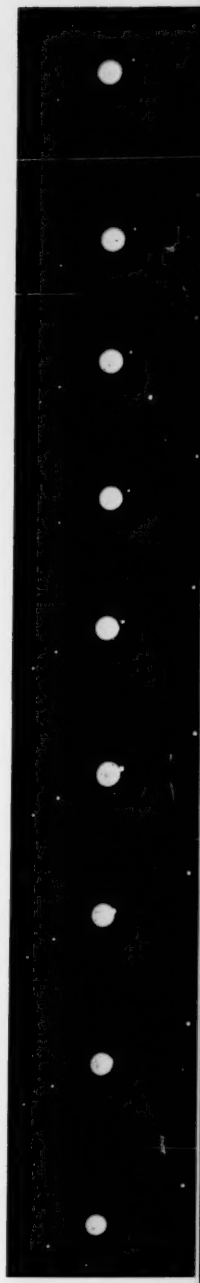
Venus: brilliant, magnitude —3.3 near western horizon. In close conjunction with Mars, July 11 (separation 0°25′) and with Jupiter, Aug. 22 (separation 0°28′).

Mars: in west, setting about 1.5 hours after sunset during early July; too near sun for observation during August. In close conjunction with Venus, July 11.

Jupiter: bright, in constellation of Virgo, magnitude —1.5. At beginning of July, sets about 12:30 A.M.; at end of August, about 8:45 P.M. In close conjunction with Venus, Aug. 22.

Saturn: slightly brighter than magnitude 1, will transit about 11 P.M., July 1. Visible during most of the evening; ends retrograde motion Aug. 12; in quadrature with sun Aug. 31, setting about midnight.

NOTE: "Sky Diary" will appear regularly every issue *if enough readers signify their interest in it by writing us post cards promptly.*—ED.



➔ Jupiter and its four bright satellites, with 12-inch refractor at Griffith Observatory, Los Angeles. One-minute exposure at half-hour intervals, night of 27-28 April 1945. Left to right: Satellites IV, II, I, III. The motion of I going behind Jupiter shows clearly. (Paul Roques, courtesy Griffith)

Indian Americans

A Pictorial History of the American Indian. By Oliver La Farge. Crown Publishers, Inc., New York. 1956. 272 pp., 350 illustrations including many full color plates. $7.50.

When talking about American Indians, whether the nearly half million of them living among us today or the Indians of history, prehistory, and folklore, we are given to generalization and "lump" thinking; we cling to stereotypes and cliches, usually picturing a story-book or Hollywood Indian and making him represent all Indians, past and present. We tend to forget, or we do not know, how strongly individual and how widely varied were – and are – the peoples we collectively call Indian. Many peoples they were, drifting over from Asia since ten, possibly twenty – we may never know just how many – thousand years ago. And many peoples they remained, fanning out through both time and space over two continents. So there was never such a thing, physically or culturally, as *the* American Indian, any more than there has ever existed *the* white man.

A richly illustrated book like this furnishes abundant proof of Indian diversity, even with the scene restricted to that part of North America which became the United States and southern Canada. Compare Iroquois with Pacific Coast Miwok; or Hopi with Kwakiutl of Vancouver Island; or in general, Northeast Hunters with Southwest Pueblos, or Northwest Coast tribesmen with almost any desert dwellers. Or, timewise: look at a 20,000-year-old flint spearpoint and what it implies, then at a Mohawk steel-worker coming down at five o'clock from the top of a Manhattan skyscraper skeleton and taking the subway to his flat in Brooklyn! These are "The American Indian."

Through an album of pictures carefully selected from documented sources embracing some "5,000 drawings, paintings, photographs, engravings and manuscript illuminations," and through his forthright and readable text which alone would add up to a substantial book, Oliver La Farge, a widely known writer and authority on his subject, has given us the basis for greater understanding and appreciation. This is a book of fact, not romance, and it should contribute something to the processes, often difficult on both sides, by which the anything but "vanishing Americans" are becoming part of the modern nation but without altogether losing their cultural heritages any more than the transplanted Europeans are totalling abandoning theirs.

Trappers, Indians, and the Columbia

The Fur Hunters of the Far West. By Alexander Ross. Edited by Kenneth A. Spaulding. University of Oklahoma Press, Norman. 1956. xxiii + 304 pp., 20 halftone illustrations. $5.00.

A remarkably able description of events in the Oregon territory centering around the fur trade in the early 1800's, combined with vigorous personal narrative of one who took part in many of these events, came from the pen of a Scot, Alexander Ross, and was first published in London in 1855, in two volumes, but with extensive editing. The present edition, comprising volume I and parts of volume II, "allows the account to stand in the words of the author wherever the meaning is not obscure."

Ross' journal will appeal today to those who relish the day-by-day incidents of which history is made, the "this is what happened here, at this moment" kind of thing, which so often hinged on the turn of a hand or of a word, or how a trail or a river bent, or the state of the weather. The larger immediate context is the activities of the Hudson's Bay Company and the North West Company, and their surprisingly bloodless conflicts with American trappers and fur dealers. Back of all this lay the respective philosophies guiding the men in the field, and the attitudes of their respective governments; and the outcome, in time, was the settlement of the Oregon country and its ultimate annexation by the United States.

The story naturally has a great deal to do with relations between the fur men and the Indians who inhabited the region, with the inevitable mixture of commercial dealing, surface friendliness, and armed hostility.

* * *

Coming from the Univeristy of Oklahoma Press on September 6 is another contemporary account, that of a young Astor man, Ross Cox. The title is **The Columbia River:** *Or scenes and adventures during a residence of six years on the western side of the Rocky Mountains among various tribes of Indians hitherto unknown; together with "A Journey across the American Continent."* The book will be part of Oklahoma's The American Exploration and Travel Series, which means it is an important contribution to the literature in that field of interest.

For general reading in the history of the period, there is the new **Empire of the Columbia** by C. M. Gates (Harper, 1957, $4.50) which has had excellent reviews for its lively and readable account of the Oregon story.

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firmation of these observations were made by Gallet of the National Bureau of Standards with a radio telescope at Table Mesa, near Boulder, Colorado. Two types of signals are received from Jupiter: (1) slow bursts lasting but two or three seconds that sound like grinding when converted into sound, and (2) sharp clicks of extremely short duration that follow one another in pulses. The grinding sounds may be due to widespread thunder storms caused by the clashing clouds of the Jovian atmosphere, or shockwaves spreading outward through an ionized atmosphere.

To account for the clicks occurring in pulses, it has been proposed that the first click we receive arrives on earth directly from the disturbance in Jupiter's atmosphere; the second click, arriving on the heels of the first, may be an echo of the original disturbance that is reflected by Jupiter's surface; and finally, the third click would be a double echo resulting from the disturbance ricocheting from an ionized layer in Jupiter's atmosphere to the surface of the planet and thence out into space to the earth. Dr. John D. Kraus, of Ohio State University, has calculated the depth of Jupiter's atmosphere, based on the timing of the pulses, to be 22,000 miles. This is considerably deeper than previous estimates.

Jupiter provides hours of enjoyment for the amateur astronomer. Through his telescope he may watch the four bright satellites parading from one side of the planet to the other. Occasionally one or two moons disappear behind the planet's limb only to reappear a few hours later on the other side. Under steady seeing conditions, one may trace a satellite as it transits across the Jovian face; oftentimes its shadow may be cast upon the planet's disk. This retinue of the King of Planets will provide part of the material for a future article on the satellites of the solar system. C.F.H.

Midsummer medley

With the majority of us who are going camping this summer about to set forth and create the season's peak on the highways and insufficient campgrounds, even the experienced should find these items useful, beginners—invaluable: **Sunset Ideas for Family Camping,** Lane Publishing Company, Menlo Park, Calif., 1957, 128 pp., fully illus. in hafltone and line, $1.75; for auto and trailer campers the complete how-to-do-it: planning, equipment, camp living. **Campsite Finder:** *Vol. I, Western U.S.A. and Canada* (plus Alaska), by Richard and Jane Hartesveldt, Naturegraph Publishing Co., San Martin, Calif., 128 pp., photos, $1.50; for each state and province, campgrounds listed by highway numbers; off-highway sites by national forests, etc. — over 2500 public campsites located. For nature lovers, items from Naturegraph: **Rocks and Minerals of California and Their Stories,** by Vinson Brown, David Allan, revised ed. 1957, 120 pp., illus. in full color and line, maps, paper $2.75, cloth $4.50; best handbook available. **An Illustrated Guide to Fossil Collecting,** by Richard Casanova, 1957, 80 pp., 113 figs. in halftone and line, $1.50; an excellent introduction to the field for students and amateur collectors. **The Californian Wildlife Region,** by Vinson Brown, revised ed. 1957, 128 pp., fully illus. in halftone and line, paper $2.00, cloth $3.00; plant and animal life of foothill, valley, and coast, ecologically arranged with all principal species illustrated; proved by two years general and student use and wide sale.

Escape to the West Indies: *A Guidebook to the Islands of the Caribbean with photographs by the author.* By Bradley Smith. Alfred A. Knopf, New York. 1956. xi + 397 pp., profusely illustrated, frontispiece in color, endpaper map. $4.95.

It would be hard to imagine a more inviting book about the perennially fascinating micro-world of the Caribbean islands, whether for travel guide or general reading, than this exceptionally handsome one by a well-qualified author-photographer. Bradley Smith owns a hotel on St. Vincent, has traveled widely throughout the other islands, and has had a picture story in *Life*, "West Indies Escape," which formed the basis for the book itself.

The principal islands are described individually in words and pictures. A 110-page Appendix provides "Tabular Information for Tourists, Travelers, and Prospective Settlers." The book is printed throughout on coated stock to make possible the attractive magazine style of the pages, with photos bled and placed where they are most effective. It makes you want to pack up and go.

The Lake of the Sky, Lake Tahoe: *in the High Sierra of California and Nevada.* By George Wharton James. With a Foreword by the Right Reverend Noel Porter, D.D. The Charles T. Powner Co., Chicago. 1956. xlvi + 414 pp., 61 halftones, endpaper maps. $4.95.

This classic by a writer on the Western scene widely read in his time was first published in 1914 (to judge by the date of the author's Introduction), and doubtless helped to make the Tahoe region the well developed vacation and year-round community it is today. Its greatest appeal now, perhaps, in this reissue with many modern illustrations added, will be to leisured readers in their Tahoe homes and summer cabins, who want to enlarge their perspective on the grand scene around them — not to the hurried week-ender flying up from the Bay. People who pound up U. S. 40 and 50 in half a day would be highly amused at James' description of an automobile trip to the Lake in the pre-World War I era.

Bay Window Bohemia: *An Account of the Brilliant Artistic World of Gaslit San Francisco.* By Oscar Lewis, Doubleday & Company, Inc., Garden City, New York. 1956. 248 pp., 22 photographs, 2 line cuts. $3.95.

Going to San Francisco this summer? Live here? Either way, you may imbibe from this one of Oscar Lewis' many essays in our local history the essence of mauve that still flavors and colors The City, however wanly a half century after gaslight. If there's anything in the Golden Age idea, that last quarter of the 1900's still wears the halo, at least in San Francisco's corporate memory of a colorful collection of illustrious members — what would the times have been without Jack London, George Sterling, Ambrose Bierce, Lillie Coit, M. H. de Young, Frank Norris, David Warfield, Gelett Burgess, William Keith, Porter Garnett, to mention a very few of Lewis' subjects who enlivened Telegraph Hill, the Montgomery Block, Coppa's, the Bohemian Club, the Bush Street and Alcazar theaters, and other San Franciscan ecological niches adapted to literary and artistic types? And while the face and flesh of culture waxed through theater, music, and the products of "brush, pen, and chisel," a strong frame was already well provided by such learned if less showy institutions as the University of California, the younger Stanford, the California Historical Society, Geographical Society of the Pacific, and — oldest of them all — the California Academy of Sciences.

Gold in Them Hills: *Being an Irreverent History of the Great 1849 Gold Rush.* By Phil Stong. Doubleday & Company, Inc., Garden City, New York. 1957. 209 pp. $3.50.

"The California gold field was a fairly tiny sliver of the continent in the mackerel-shaped valley, headed south, between the Sierras on the east and the coast range on the west. It should be a lake but it has some peculiarities of soil and elevation so that it manages to tip the drainage of the Sierra watershed out through the spout which the Sacramento has cut through the coast range, and in various small places, without floating off the population." Thus Phil Stong, on the physiographical stage setting for his lustily human story of the population which largely poured back and forth through the spout between San Francisco and Sacramento in them days of '49, '50, and thereabouts. The irreverence is a matter of looking at history rather freshly — thank goodness. The truth of the funnel figure is very clear in Palacios' beautiful ochre-printed endpaper map: this is much the story of how San Francisco sprouted and grew on its golden hinterland, and what it was somewhat amazingly like in the raw just so few years before Oscar Lewis' *Bay Window* era. A treat for a long summer evening.

In Search of the Golden West: *The Tourist in Western America.* By Earl Pomeroy. Alfred A. Knopf, New York. 1957. xii + 233 + vi (Index) pp., 25 halftone illus. $5.

Soon after the gold-diggers and pioneer settlers came the West's first tourists, on the first rails, in luxurious parlor cars and Pullmans. They came with Eastern, and European, attitudes, romanticizing, criticizing, insulating themselves from hardship and not accepting the West for what it was but comparing it with what was familiar and comfortable. From their books and articles a University of Oregon history professor, Earl Pomeroy, has compiled their collective attitude, tracing the *idea* of the West down through viewpoints as they changed with modes of travel and numbers, documenting the gradual Easternization of the West, and concluding with a look at present times in which Western week-end tourists outnumber long-haul Easterners and small roadside establishments get more

tourist cash than luxury hotels such as catered to the early parlor-car contingent. It makes a surprisingly readable book, and one which shows how involved and subjective and emotional we can become in our geographical identifications.

Redwood Railways: *A Story of Redwoods, Picnics and Commuters.* By Gilbert H. Kneiss. Howell-North, Berkeley, California. 1956. xviii + 165 pp., 40 pp. of halftones, numerous illustrations in line, 2 folded insert maps in back pocket, 2 endpaper maps. $4.75.

A well known railroad historian, a Western Pacific official, Gilbert H. Kneiss has given railway fans and students of the fascinating detail of local history a grand book about the origin of the Redwood Empire Route. Properly the Northwestern Pacific Railroad, the only surviving northwestern coastal California system had most lively beginnings in the efforts of San Francisco Bay communities to reach out and exploit the northern hinterland. As San Francisco looked north for markets, produce, lumber, vacation spots, and finally suburban living a wondrous rail network grew, had its colorful heyday, and inevitably yielded steel to macadam and concrete. You don't have to be old to have taken the narrow-gauge to Pt. Reyes Station, Tomales, or Cazadero for the week end or summer; or to have zigzagged up Mt. Tamalpais on "the crookedest railroad in the world"; or to have commuted from Fairfax, San Rafael, Mill Valley, and other Marin points by steam or later electric cars to meet the ferry at Sausalito. The story brings waves of nostalgia to many hot and diesel-fumed bus commuters now; but whether one still hears the musical click of rails and the throb of engines beneath the promenade deck – longingly – or belongs to the generation which has always rolled to work on rubber, the story of *Redwood Railways* is well worth reading.

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Jack London's Tales of Adventure. Edited by Irving Shepard. Hanover House, Garden City, New York. 1956. xii + 531 pp., 56 photographs. $4.95.

One of the most brilliant, and controversial, personalities of Oscar Lewis' Bohemian gallery was Jack London, born in San Francisco in 1876, who in a 40-year lifetime wrote off the Victorian romantic era with a stupendous literary output of the kind termed realistic. From his "eighteen novels, twenty volumes of short stories, seven non-fiction books, three plays, and hundreds of newspaper and magazine articles, essays, and reviews," his nephew has selected the contents of this stout volume, which includes photographs from London's albums, most of them his own.

Of special interest to us here – all non-fiction – are excerpts from *The Cruise of the Snark* in the Pacific; selected dispatches from his coverage of the Russo-Japanese War when he was "one of only seven correspondents to reach the front lines," through sheer daring and determination; and, brief, simple, but spiked with telling incident, "The Story of an Eye-Witness" to the great San Francisco earthquake and fire of 1906. D.G.K.

A Space Traveler's Guide to Mars. By Dr. I. M. Levitt. Henry Holt & Co., New York. 1956. 146 pp., 16 pp. photographic plates, 2 appendices, glossary, bibliography and index. $3.50.

A descriptive treatise on the planet Mars is one of the most overworked forms in popular scientific literature. Many of these are either too brief to be thorough, or so technical as to endanger their value as a popular treatment. *A Space Traveler's Guide to Mars* is neither of these.

Dr. Levitt, for several years, has been director of the Fels Planetarium of the Franklin Institute in Philadelphia. In his successful career of bringing astronomy to the layman through the medium of the planetarium, he has caught the layman's attitude toward science and his reaction to gentle exposures to it. Dr. Levitt anticipates the questions and doubts of non-scientists and yet pursues his discussion of his subject with the organized approach of the scientist he is.

Chapter Four is titled "The Face of Mars." It is, in this reviewer's opinion, one of the best accounts of the history of observation of Mars and interpretation of its results yet written outside highly technical monographs.

The final chapter, "Life in the Universe," supplemented by the author's second appendix, "Life's Beginning," is a most complete and convincing statement of the position of the scientist and the status of his science in a field that is no longer the complete mystery it once was. With the actual fabrication in the laboratory of the complex molecules known as amino acids, man has been making the building blocks of living things. While these relatively simple organic molecules are, in the author's words, ". . . as far removed from protein molecules as a few blocks of stone are from a castle," the importance of the accomplishment is in the proof of a long-held theory regarding the conditions and the processes which brought life into being on the earth.

Here is a book that is informative with its facts, stimulating with its propositions, and logical in the few instances of speculation. And through it all there is no confusion between fact and speculation.

The title is perhaps unfortunate. Space travel is still regarded by many as material for comic books. There is no easier attitude to acquire than cynicism, and, to many, doubt is synonymous with intellectualism. The title can imply a flippant approach to a subject that is already too much maligned. This book is nothing of this sort. It is good solid serious reading. G.W.B.

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(Continued from page 3)

Operation Deepfreeze. By Rear Admiral George J. Dufek. Harcourt, Brace and Company, New York. 1957. x + 243 pp., 23 photos, 7 maps, 8 plans, endpaper map in color. $5.00.

It remained for Admiral George Dufek himself to tell the story of Operation Deepfreeze which he commanded so ably, and he has told it with all due modesty and with full appreciation for the work and the dedicated spirit given to the task by all hands.

Antarctica in the International Geophysical Year: *Based on a Symposium on the Antarctic.* Cosponsored by the U. S. National Committee for the IGY of the National Academy of Sciences, National Science Foundation, American Geophysical Union. Geophysical Monograph Number 1: American Geophysical Union of the National Academy of Sciences – National Research Council, Publication No. 462. Washington. 1956. v + 133 pp., halftones, text figs. in line, folded insert map of the Antarctic prepared by American Geographical Society.

Introduction by Laurence M. Gould; The IGY Program of the United States, by Joseph Kaplan; Antarctic Research during the IGY, by H. Wexler. Geographic and meteorologic articles include: Antarctic Geography, by Paul A. Siple; the Weddell Sea Area, by Finn Ronne. Other articles are grouped under these headings: Geological and Structural; Upper Atmosphere Physics; Flora and Fauna.

This publication was specially prepared for use of all scientists concerned with the Antarctic program of the IGY, therefore it is extremely valuable, for reference and background information to persons indirectly concerned as well. Besides teachers, librarians, and others who have to answer John Q. Public's questions, this applies particularly to science writers – and editors. D.G.K.

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